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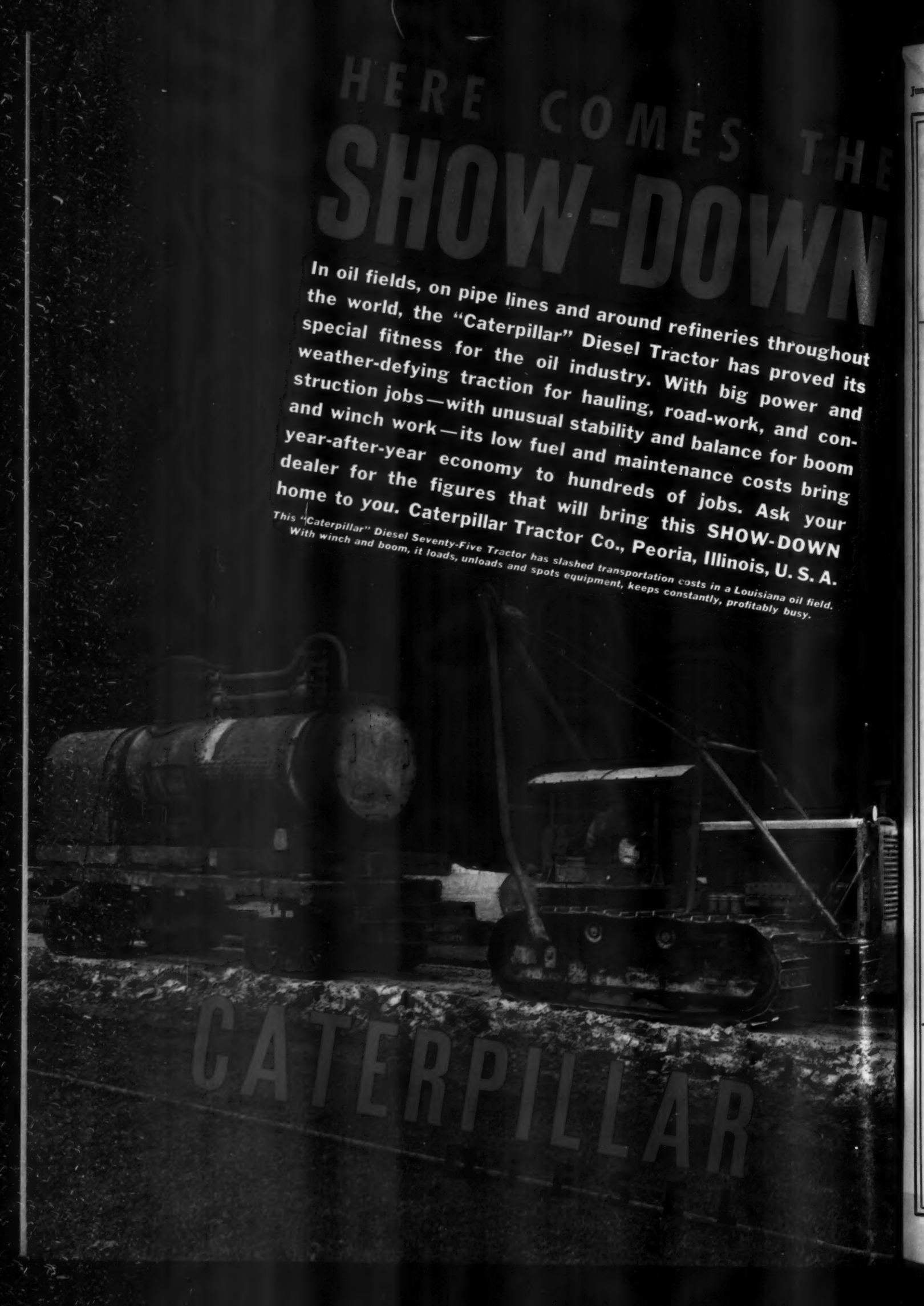
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# THE OIL AND GAS JOURNAL

Volume 34
Number 4

June 13, 1935

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## OIL MAN'S CALENDAR

### June

16-21 — White Sulphur Springs, W. Va., Society of Automotive Engineers, summer meeting, Greenbrier Inn.

19-21—Cincinnati, Ohio, American Society of Chemical Engineers.

20-21—State College, Pa., Pennsylvania Grade Crude Oil Association, annual meeting.

24-28 — Detroit, Mich., American Society for Testing Materials, annual meeting, Book Cadillac Hotel.

### August

(?)—American Petroleum Equipment Suppliers' Association, place to be named later.

19-24—San Francisco, Calif., American Chemical Society.

### September

4-5—Louisville, Ky., Kentucky Petroleum Marketers Association.

18-20—Hot Springs, Ark., North American Gasoline Tax Conference.

18-20—Atlantic City, N. J., National Petroleum Association, annual meeting, Hotel Traymore.

### October

11-12—Houston, Tex., mid-year meeting of Petroleum Division of A.I.M.E.

14-18—Louisville, Ky., National Safety Council, twenty-fourth annual safety congress.

14-18—Atlantic City, N. J., American Gas Association, Manufacturers Division.

14-19 — Oklahoma City, Okla., National Tax Association, Oklahoma Biltmore Hotel.

### November

4-5 — Dallas, Tex., I.P.A.A. annual convention.

11-14 — Los Angeles, Calif., American Petroleum Institute, sixteenth annual meeting, Biltmore Hotel.


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**Bakwik Drill Pipe Floats are made in both A.P.I. Standard and Full Hole Types. The long-wearing alloy steel body, with tool joint threads, is placed at any point in the string and left there—the valve assembly is easily removed, as illustrated, and explained below.**

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2. **You gain by longer life of wire lines and brake bands.**
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4. **No more wet pulling jobs.**
5. **Reverse circulation can be secured at any time by unseating the back-pressure valve.**
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7. **Danger is less in case of a parted drilling string.**
8. **You can safely "float in" the longest, heaviest string of drill pipe.**

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**The abrasion-resisting valve assembly rests on a shoulder in the streamlined cavity of the body, and is held securely in place by the tool joint pin above it.**

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**BAKER BAKWIK DRILL PIPE FLOAT**

# Constructive Developments and Record Gasoline Consumption Brighten Industry's Outlook

By ANDREW M. ROWLEY

DEVELOPMENTS in the petroleum industry during the past week were calculated to give further confidence to those who had been somewhat doubtful regarding the immediate effect, chiefly on the price structures, of the decision of the Supreme Court invalidating NRA codes. Of especial importance was the meeting of 800 California producers, held in Los Angeles, when every resolution was adopted unanimously and action was taken to continue stabilization efforts and maintain price structures. Observers at that meeting say it was the greatest turnout in the history of the business in California and that it showed conclusively oil men in California are determined to carry on under a plan of voluntary co-operation.

During the week crude oil production in California had recorded an increase of 85,500 barrels daily. With no state regulatory statutes and several small operators threatening to continue their overproduction, regardless of consequences to the industry as a whole, there had been considerable trepidation as to the effect a possible continued overproduction might have on price structures, both crude oil and gasoline. Major buyers have assured operators there will be no cut in crude prices in California if producers work out a curtailment plan and adhere to it rigidly.

Steps taken by the American Petroleum Institute to formulate a voluntary code relating to fair practices and other operating features reflected the feeling that every effort should be made to continue the benefits of stabilization programs worked out by the industry.

Establishment of a new all time high record of gasoline consumption in the United States during April and the fact domestic consumption during the first four months of this year was slightly more than 4 per cent greater than during the same period last year, the year when the peak record of gasoline consumption in this country was established, shows conclusively the improvement in the oil business. Benefits of this improvement, in the form of better prices, are a foregone conclusion if every branch of the industry will co-operate in efforts to maintain the proper balance between supply and consumer demand. But, it must be remembered, bright prospects in the past have been wrecked by some operators trying to obtain a greater than equal share of such benefits.

Field operations throughout the country continue to increase. In New Mexico the Ohio Oil Company completed a well four miles south of the Eunice Pool, rated at 12,000 barrels daily. Two wildcats in the Oklahoma City area of Oklahoma further stimulated already increased activity in that state. In Kansas 32 wells were completed and 30 new operations started during the week. Michigan continues as a center of interest and is maintaining its production at a high level.

## Crude Oil Production in the United States

Estimated daily average production for the week ending June 8, a comparison with previous week and the Federal allowables follow:

| | | Federal allowable | |
|---|---|---|---|
| | June 8 | June | June 1 |
| Oklahoma— | | | |
| Oklahoma City | 143,800 | ..... | 138,950 |
| Seminole-St. Louis | 95,950 | ..... | 99,075 |
| Remainder of State | 247,925 | ..... | 256,750 |
| Total Oklahoma | 487,675 | 514,200 | 494,775 |
| East Texas— | | | |
| Lathrop | 163,820 | ..... | 160,537 |
| Kilgore | 155,224 | ..... | 154,723 |
| Joiner | 152,737 | ..... | 152,837 |
| Total East Texas | 471,781 | ..... | 468,097 |
| West Texas | 153,397 | ..... | 151,075 |
| North Central Texas | 84,834 | ..... | 84,610 |
| Texas Panhandle | 54,827 | ..... | 62,523 |
| East Central Texas | 50,350 | ..... | 47,375 |
| Gulf Coast—Texas | 178,543 | ..... | 178,473 |
| Southwest Texas | 59,138 | ..... | 59,050 |
| Total State of Texas | 1,052,870 | 1,059,300 | 1,051,203 |
| Kansas | 142,100 | 154,300 | 153,225 |
| North Louisiana | 22,940 | ..... | 23,185 |
| Gulf Coast—Louisiana | 110,947 | ..... | 115,927 |
| Total Louisiana | 133,887 | 132,300 | 139,112 |
| Arkansas | 31,080 | 30,700 | 31,190 |
| Eastern Fields (except Michigan) | 107,000 | 103,700 | 105,000 |
| Michigan | 41,730 | 36,800 | 40,326 |
| Rocky Mountain area | 103,470 | 107,000 | 100,140 |
| California— | | | |
| Santa Fe Springs | 40,750 | ..... | 35,500 |
| Long Beach | 75,500 | ..... | 58,500 |
| Mountain View | 20,250 | ..... | 15,250 |
| Elwood | 12,400 | ..... | 12,250 |
| Kettleman Hills | 53,250 | ..... | 51,500 |
| Remainder of State | 353,350 | ..... | 297,000 |
| Total California | 555,500 | 512,700 | 470,000 |
| Total United States | 2,655,312 | 2,651,000 | 2,584,971 |

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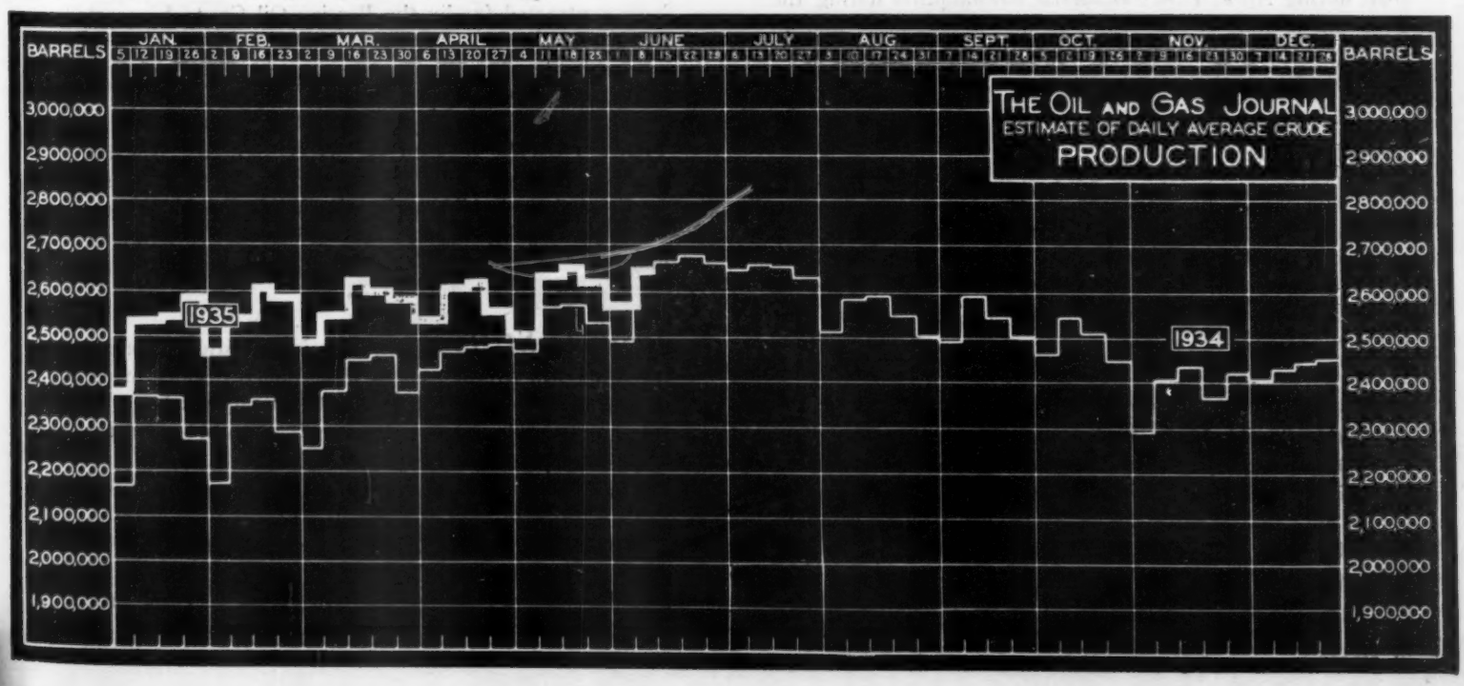


# The Bulletin Board

***Federal Legislation*** relating to the petroleum industry may take the form of approval of the interstate compact with the creation of a federal fact-finding agency to recommend, in an advisory capacity, production quotas. It is felt the Thomas bill will not be passed, especially in its present form, although there still is a possibility Congress may enact the Wagner labor disputes bill and the Wheeler-Rayburn holding company measure.

•

***A 180-Mile Gasoline Pipe Line*** will be constructed by the Keystone Pipe Line Co. (Atlantic) from Harrisburg to Pittsburgh, this being an extension of the present line from Philadelphia.

•

***Chairman Cole*** and Secretary Ickes do not agree on what legislation is needed for the petroleum industry. The former is very definite in his belief nothing is needed at this time except ratification of the interstate compact, but the former oil administrator is still preaching the doctrine of making the industry a public utility.

•

***Pennsylvania Production*** methods were discussed during an especially interesting and instructive program presented at the Eastern District, Division of Production, of the American Petroleum Institute at Pittsburgh. Present and future methods in obtaining the maximum quantity recoverable from the reserves of Pennsylvania Grade crude, estimated at more than 5,000,000,000 barrels, were considered.

•

***Gasoline Consumption*** during April established a new high record for that month and was 10 per cent greater than during April, 1934. Domestic consumption during the first four months of this year was 4.1 per cent more than in the similar period last year. Domestic consumption last year established an all time high record.

•

***Provisions of the Code*** of fair competition for the petroleum industry, invalidated by the Supreme Court decision, would be continued as a voluntary code if recommendations of the Board of Directors of the American Petroleum Institute are followed. These provisions relate to rules of fair practice, present wages and hours of labor and the employment of child labor.

•

***Directors of the A.P.I.*** recommended that Congress approve the interstate compact; that the president be authorized to limit imports; that the Connally Act be made permanent; that the Bureau of Mines continue to estimate currently crude oil requirements for the country as a whole and each producing state; and that the industry unite in opposing any further Federal legislation for regulation of any branch of the petroleum industry except as above specifically stated.

***The Code*** of Fair Marketing Practices, approved by the Federal Trade Commission June 12, 1931 is still in effect and committees of the petroleum industry are working now to adapt that code to present requirements in the marketing end of the business. Members of the marketing committee of the P. and C. Committee have been appointed by directors of the A. P. I. as a committee to recommend immediate revision of the original code.

•

***Modern Refineries*** require the use of metals that will withstand temperatures from 70 degrees below zero to 1,300 degrees above, pressures up to 2,200 pounds per square inch, and metals which will show unusually high tensile strength, high impact resistance, improved creep values, resist corrosion and abrasion and show unusually good fatigue results.

•

***Death*** claimed four especially well known oil men during the past week: Oscar Sutro, vice president and counsel of the Standard Oil Co. of California; Martin Moran, retired president of the Texas Pipe Line Co. of Oklahoma; Ralph H. Kinsloe, vice president and general manager of the Magnolia Petroleum Co., and William L. Norton, owner and operator of several hundred stripper wells in Oklahoma.

•

***Metallurgy***, a subject of rapidly growing interest and importance in the petroleum industry, can be made more understandable and the selection of proper materials a more simple matter with some knowledge of the fundamentals governing the subject. In proprietary names there are upwards of 400 different types of corrosion and heat resistant alloys but these can be broken down to four different groups.

•

***The Largest Distillation Unit*** ever built has been contracted for by the Persian Oil Co. to be erected at its Abadan refinery. The unit will process 65,000 barrels of oil daily.

•

***East Texas*** runs to refineries showed a decline last week as efforts were being made to prevent further sales of confiscated crude oil at prices far below the current market. Sales had been made at 40 cents a barrel without public bidding.

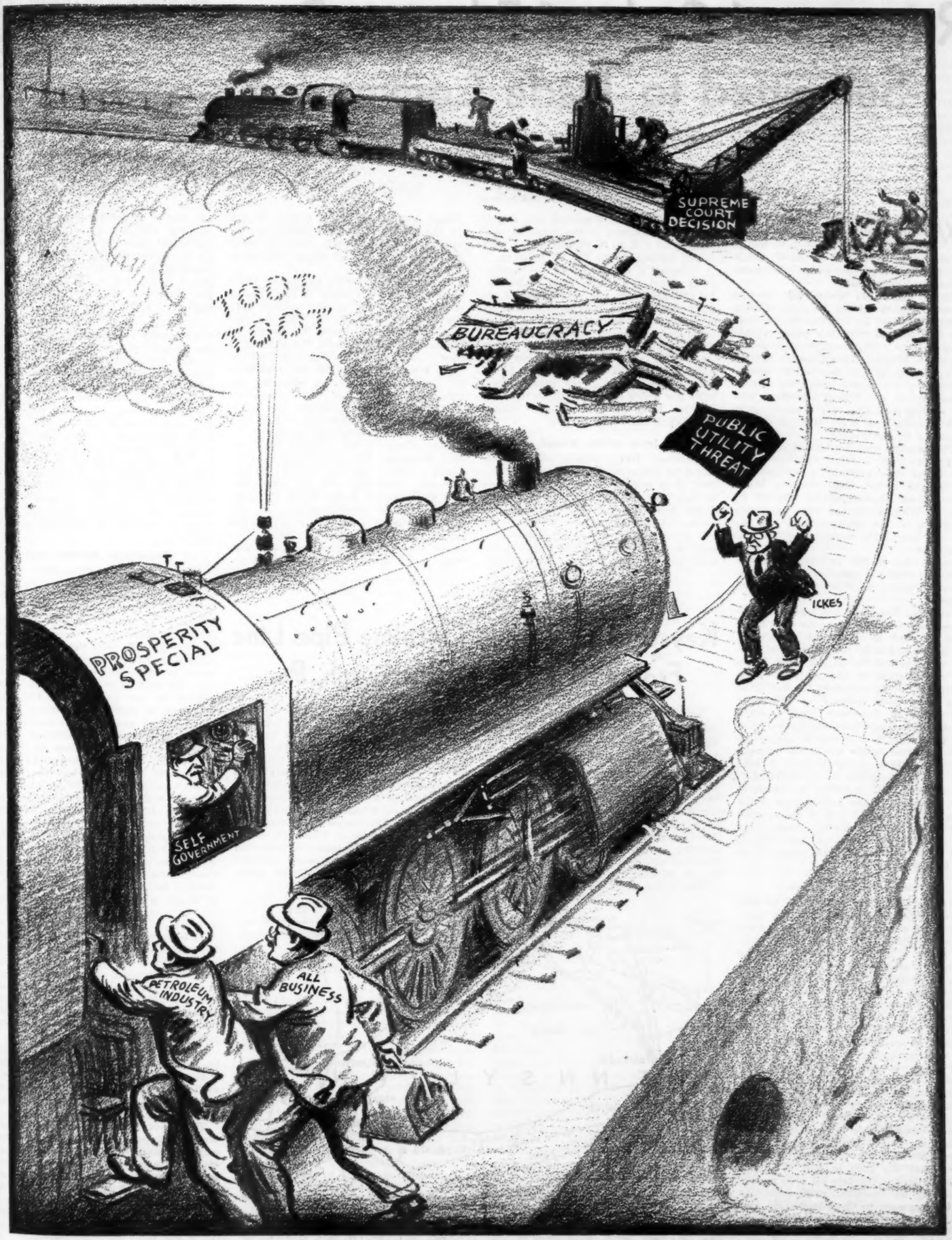
•

***Runs to Stills*** in refineries in the Mid-Continent during June will average about 20,000 barrels daily more than during May. The increase reflects an improved market demand and should not be interpreted as any let-up in the stabilization program.

•

***Production Problems*** increased in number by the necessity of deeper drilling, provide a fertile field for the metallurgist and manufacturer of equipment. These problems include abrasion, fatigue of metal, corrosion, stress, and pressure.

# His Last Gesture




*—Drawn Exclusively for The Oil and Gas Journal.*

# Revision of Code of Ethics to Be Submitted to Trade Commission

By HUGH D. MALLON
Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., June 10.—President Roosevelt has not yet divulged the extent to which he will go in urging the regulation of the oil industry, but it is not expected he will recommend the Thomas bill.

Other legislation which will have a direct effect on the oil industry is being strongly pushed by administration leaders in Congress with the prospect that some of it may be passed, most important being the Wagner labor disputes bill, already passed by the Senate and recommended by the House Labor Committee. Opposition to the Wheeler-Rayburn utility holding company bill is growing in both Houses, but it is believed it will be passed by the Senate.

The gasoline and lubricating oil taxes, as well as other so-called nuisance taxes, are being considered by a sub-committee of the House Committee on Ways and Means. Representative Samuel B. Hill of Washington has been appointed chairman of this subcommittee, but has not yet named the members of his subcommittee.

By a vote of 261 to 121 the House voted to extend a greatly amended National Industrial Recovery Act until April 1, 1936.

President Roosevelt has vigorously expressed his opinion that under the amendment, as well as under the decision of the Supreme Court, voluntary codes cannot be approved by him if such codes are in violation of the antitrust laws. According to the President the anti-trust laws have been restored to full force and effect by the court, and Attorney General Cummings impliedly agreed with the President in a statement indicating that antitrust suits would be brought against members of any industry if there was any continuation of price fixing.

Practically all members of Congress who have studied the implications of the amendment, however, are of the opinion that codes on a voluntary basis, may still be evolved under the new law, if such codes are given the approval of the President.

### Revise Code of Ethics

Whether voluntary codes will be permitted under a relaxation of the antitrust laws or not, the marketing branch of the oil industry is preparing to operate under a revised code of marketing ethics prepared by the American Petroleum Institute. To accomplish the amendments, and to get the will of the oil marketers incorporated into the finished document, the Marketing Committee of the Planning and Coordination Committee, as well as all regional, district, state and local marketing sub-committees, have been appointed members of the Institute's Division of Marketing. Almost no opposition has developed to the suggestion of resumption of operations under this code.

Inquiry at the office of the chairman of the Federal Trade Commission, under whose auspices the original Code of Marketing Ethics was promulgated, has shown that the code is still in effect, the operation of the late oil code merely suspending its functioning. Amendments can be suggested to the Commission and if found not in contravention of the Federal Trade Commission Act, or the antitrust laws, will be approved by the commission.

While President Roosevelt has not divulged to members of the press to what lengths he will go in recommending regulatory legislation for the oil industry, it is believed, if he adheres to the implications stated at a recent press conference, he will urge only the ratification of the interstate compact, making provision for a Federal fact finding agency to recommend, in an advisory capacity, state production quotas. The inference drawn from these remarks was that the only legislation further than this would be the making permanent of the present Connally law which expires on June 16, 1937, this law being all that would be needed to bulwark the compact plan.

### Ickes Utility Threat

Secretary Ickes, former oil administrator, is preparing a report to the President, it is being rumored here, in which he has been asked to outline the legislation necessary for the regulation or control of the oil industry. When Ickes was questioned at a recent press conference he stated that Charles Fahy, chairman of the Petroleum Administrative Board was preparing a report to him on the subject of Federal legislation, the report to deal primarily with the legality of the Thomas Bill which he heartily indorsed.

Chairman Fahy, when questioned about the report and the study of the Thomas Bill, said, he was of the opinion that the Supreme Court in its NRA decision had impliedly sanctioned the control of commerce by the Federal Government if such commerce was of the so-called stream type, commerce which in the course of the production of the raw material, the refining of the product, and the marketing of the refined products was in a steady stream into states other than that in which it was originally produced.

This premise is not accepted by President Roosevelt nor by any other legal minds familiar with the court's decision. President Roosevelt said the court had said that mining, under which category would come the production of crude oil, was specifically excluded from Federal jurisdiction, manufacturing, which includes the refining of oil was excluded from such regulation, and marketing, which is distinctly intra-state in character was also exempt from such regulation.

One rumor has it that the report has been submitted to the President but that has been discarded by him upon the recommendation of some members of Congress who have studied the oil problems and are aware of the limitations of the Federal Government, while at the same time having the best interests of the oil industry at heart.

### Chairman Cole's Position

Regardless of these rumors it has been definitely learned that Representative Cole, chairman of the Petroleum Investigating Subcommittee, is firmly convinced that only legislation necessary to set the oil industry on its feet is ratification of the interstate compact. It is his opinion no further legislation is needed, and although his out-spokenness at the recent conference at the White House on oil legislation did not meet with the approval of the Secretary of the Interior, it is believed it put the problem before President Roosevelt in a different light.

Secretary Ickes is still of opinion "that the industry might well be placed in the category of a public utility," although he has not advanced any plan whereby this status would be legally possible. His most recent statement on the subject was in relation to voluntary codes to govern the oil industry. It is his opinion the oil industry could not possibly regulate itself under such a code, his statement being that the minds of the industry have not changed much in the last two years. Asked specifically if he still favored the making of the industry a public utility he stated if there was no other way to regulate the industry under the constitution it should be declared a public utility.

### Imports to Revenue Bill

Meanwhile, it is rumored the administration leaders are considering ratification of the compact, leaving the Bureau of Mines in its present capacity of an advisory nature to the oil producing states, recommending state production quotas, and the elimination of the provisions restricting imports from the proposed measure. The question of imports, it is the opinion of some, should be considered in the general tax bill which will soon be under consideration by the House Ways and Means Committee.

The Petroleum Administrative Board, it is reported, will continue to function for at least 30, and probably at least 60 days, after June 16, when the original N.I.R.A. expires. It will be enabled to do this under a special appropriation from the Public Works Administration fund which is supposed to be used to alleviate relief expenditures.

Reports from the Bureau of Mines indicate the production quotas and the forecasts of gasoline demand by refinery districts will be continued by the Bureau of Mines in a purely advisory capacity.

### Wagner Bill

In tightening up the loose ends which have been severed by the Supreme Court it is expected the Wagner labor disputes bill will be jammed through the House, as it was in the Senate a couple of weeks ago. The bill has been favorably reported to the House by the Committee on Labor, the expectation being it will be considered in the very near future.

Some amendments have been inserted by House floor leaders designed to make it more nearly conform with the decision of the Supreme Court, but the consensus is that, if passed, it will be condemned by the court.

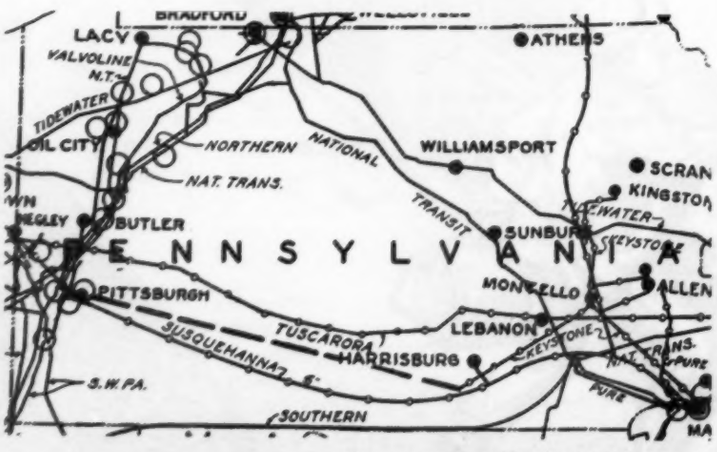
The effect of the bill will be to outlaw all company unions as such unions may no longer be assisted in any financial way under the law. The act also seeks to set up the so-called "majority rule" plan, which has been declared unconstitutional by numerous decisions in Federal district courts when its application was attempted under Section 7(a) of the N.I.R.A.

(Continued on Page 32)

# Keystone to Extend Gasoline Pipe Line From Harrisburg to Pittsburgh, Pa.

The Keystone Pipe Line Co., a subsidiary of the Atlantic Refining Co. of Philadelphia, has let a contract to the Mitchell-Stewart Construction Co. of Dallas, Tex., for the construction of 180 miles of 8-inch line from near Harrisburg, Pa., to Pittsburgh. The new line, for the transportation of gasoline, will be a continuation of the gasoline pipe line laid about four years ago from Philadelphia to the point near Harrisburg. The line will have a capacity of approximately 20,000 bbls. of gasoline daily.

The Atlantic Refining Co. operates three refineries in Pennsylvania. The largest plant is located in Philadelphia and has a capacity capable of processing 70,000 bbls. of crude daily. The greater share of the gasoline to be marketed by the company out of Pittsburgh will probably originate in the Philadelphia plant and be transported through the new line even though the company has a refinery at Pittsburgh. The Pittsburgh plant has a capacity of 8,000 bbls. daily. The other plant is located in Franklin and has a daily crude capacity of 9,000 bbls. All plants are equipped with cracking facilities.




—Map Copyright by The Oil and Gas Journal.

*Map of oil and gasoline trunk pipe lines in Pennsylvania. Broken line shows route of Keystone Pipe Line Co.'s extension to Pittsburgh*

# Discussion of Technical Problems Feature of Pittsburgh Meeting

By R. C. CONINE

PITTSBURGH, Pa., June 10.—Papers which left little for further inquiry by non-technical producers in the Pennsylvania Grade fields made the meeting here of the Eastern District, Division of Production, of the American Petroleum Institute one of the highlights in the region's calendar. From the opening presentation by P. H. Curry covering the present and future aspects of the Eastern fields, to the description of latest methods of plugging off permeable lenses of saturated or barren sands in water flooding and air-gas repressuring by C. P. Parsons, the 340 operators in attendance rarely left their places.

Modernization or abandonment might have been the title of Mr. Curry's paper. Mr. Curry, who is president of South Penn Oil Co., largest producer and purchaser of grade crude oil, presented a long range view of the situation. He said it cannot be assumed by any stretch of the imagination that the available oil of Pennsylvania Grade that can yet be produced can be produced at present prices. The reserve oil in this area is of tremendous proportion. According to figures in a recent congressional report there are 5,750,000,000 bbls. of oil in place in the Pennsylvania grade area for available recovery operations. It might be a hazardous prediction, but it may be possible to produce as much as 5 per cent of this crude under present day secondary recovery methods at current prices.

With a daily production of 70,000 bbls. this estimation would account for a period of about 10 years operation and for approximately 287,000,000 bbls. of oil in place. But this volume is really a small part of the estimated reserve of Pennsylvania crude. Another part of the congressional report indicates that of this reserve of 5,000,000,000 bbls., approximately 1,000,000,000 bbls. of grade crude can be recovered, which, at the daily rate of 70,000 bbls., would give the field a future life of 39 years. However, it appears certain that a major part of this reserve cannot be recovered at current prices, but will be compelled to wait for a market that will permit its economic recovery. Here is the problem, Mr. Curry said. What is the method or means for protecting this reserve? It is apparent that the trend of thought and of the times is the necessity of producing the most likely properties of potential value with secondary recovery operations, and permit other properties of potential value to lie dormant, while abandonment of the poorer yielding properties is executed for sake of economic security.

Mr. Curry pointed out that by grouping contiguous properties under one management and operating them as a single unit for secondary recovery operation, benefits may be gained by different producers of properties so small the owners may not carry on modern methods individually.

### Value of Stripper

A. E. Faine, Pennsylvania grade crude oil producer, of Ohio, strongly criticized the view that numerous stripper wells should be abandoned as uneconomic. Mr. Faine said men in the oil business should look at the industry from the outside, as the layman does, so they may appreciate that the public has the most important stake in the business and its prospects. We cannot, Mr. Faine said, wipe out a huge reserve of this valuable natural resource without imperiling our custodianship of this commodity.

"We are told crude prices must be cut so the poor downtrodden refiner may exist; we continue to pay the pipe liners the same prices we did when we sold oil for more than $6 a barrel. No one speaks a kind word for the producer who has been pinning a dollar bill on every barrel of Lima and Corning crude turned into the line, and two dollars on every barrel of Pennsylvania grade oil," Mr. Faine said. The producers themselves did not escape Mr. Faine's criticism. He pointed out that less than 50 per cent use Pennsylvania grade crude oil products because other materials are cheaper. In respect to the refiner who sold grade lubricating oils to chain stores at "15 cents a gallon" Mr. Faine said acrimony lent itself but feebly to their adequate description.

### Recovery Methods

H. R. Pierce, consulting engineer, of Pittsburgh, opening the symposium on details of oil and gas recovery by artificial means and the practical factors determining the possibility of their application, indicated the wide scope of investigations covering possible recovery methods. The Sistersville (West Virginia) oil pool, Mr. Pierce said, is being developed on the unitized plan. He described the pool as covering about 25 square miles and having 1,500 wells drilled, with 400 still producing. Operation on this plan with secondary recovery methods since May 1, 1933, Mr. Pierce said, has proved profitable. Among the various recovery methods being applied are the following:

1. Ordinary gas cycle applied to drilled intake wells; 2. gas storage with alternate pressure and depletion cycles; 3. alternate gas and air application; 4. alternate gas, air, and water application; 5. alternate and simultaneous gas and water application; 6. application of chemical reagents to remove from the producing sand practically all of the retained oil film; 7. consideration of mining although the nature of the sand and conditions in the pool indicate better financial returns from properly drilled and equipped wells.

### Need for Technologist

Dr. A. W. Gauger, of Pennsylvania State College, pointed that business sense depends upon sensible data. "Commit your errors on a laboratory scale and harvest the fruits of effort on an industrial scale," he quoted as indicating the position of the technologist in industry. Dr. Gauger discussed fundamental information needed by the oil producer. How much oil is actually in the sand, he said, is more important to know than the mere porosity of the sand. Questions which arise when recovery on a practical basis is undertaken include: How do oil, gas, water, behave when present together in various types of sandstone? What about the residual film of oil left on the sand when the recoverable (by present methods) oil has been removed? Is it thick enough to warrant costly development installations? Why have solution floods in our consolidated sands proved unsuccessful, and highly efficient in the unconsolidated formations in California? The answers to these questions and many others and the practical application of the solutions to production are being sought with considerable promise of success in the mineral industries laboratories of Pennsylvania State College, Dr. Gauger said.

Dr. G. L. Hassler, also of Pennsylvania State College, carried the discussion further into the problems of the research laboratory. He pointed out that the resistance encountered by fluids in the reservoir sandstone is not properly expressed by the usual measurements of permeability, since these measurements are based on the resistance encountered by a single homogeneous fluid (generally air) in a sandstone sample which has been carefully cleaned of all other fluids. Measurements of the resistance to flow of water set up by an oil soaked Bradford sandstone showed, he said, that the initial resistance, while the water battles with the oil for possession of the sandstone pores, is characterized by a permeability perhaps 10,000 times smaller than the true permeability. After the oil has been flooded out, enough remains in the sandstone to bring the effective permeability down to a range about 1,000 times smaller than the true permeability.

### Flow in Water Flood

Dr. Hassler believes that the flow in a water flood property may be divided into three ranges of fluid resistance: 1. the region in between the watered out sand and the oil bearing sand, relatively narrow and having highest resistance; 2. the watered out region, having intermediate resistance; 3. the oil bearing sand, bearing some gas and water, probably showing lowest resistance. He pointed out that the narrow band (1) will tend to be as long as possible by becoming wavy and fingered, because in this condition less total energy per unit volume of fluid will be required (it is a general principle of flow that the stream lines will distribute themselves in such a way that least energy will be expended). This fingering process necessarily results in considerable bypassing. These data on effective permeability, Dr. Hassler said, seem to indicate that a good deal of the flow must take place through cracks in the sand extending away from the shot wells.

The speaker next took up the microscopic aspect of flooding process, and pointed out that the problem of retention of oil by packed spheres, concerning which Mr. Pierce had offered some data, had been extensively treated by Foote, Smith and Busang, of Gulf Research laboratory, in a series of papers appearing in "Physical Review" in 1930 and later. Here it was shown, Dr. Hassler said, that the oil was retained in the form of rings of liquid formed at the points of contact of the spheres.

Work on recovery factors at the Mineral Industries Experiment Station at Pennsylvania State College, the speaker said, indicates this aspect of oil retention does not hold in the case of a water flood, since in addition to this type of retention there are also many pore spaces completely filled with oil after conventional gas or water secondary treatment. Dr. Hassler indicated other work on this problem at State College made use of a relatoin between the number of bubbling spots per unit area and the pressure applied to the gas when a piece of clean sandstone is caused to bubble under water.

### Visualizing Drive

Dr. Samuel Yuster, of Pennsylvania State College, demonstrated how the experiment station investigators set out to discover how oil is held in the sandstone, the mechanism, and in what form or condition the oil is retained. Capillaries measuring from 2 microns to 100 microns inside diameter proved that even in a simple cylinder in which a column of water moves against a column of oil there is bypassing with microscopic globules of oil clinging to the sides of the glass capillary and resisting the drive of the surrounding water.

As a simple capillary would fail to throw light upon behavior in the tortuous and irregular channels in the sandstone pay, Dr. Yuster developed a synthetic thin section of Bradford oil sand in which the drive phenomenon could be visualized under the microscopic. Grains of pyrex glass of Bradford sand size were sintered between two glass slides and provision made for introducing oil and water at one end and allowing the fluids to escape at the other end. This apparatus showed that an extremely large per cent of the oil remains in place after the sand is "watered out" because of bypassing.

Prof. H. C. George, of the University of Pittsburgh, introduced the oil mining phase of production. He said mining would probably be of little advantage outside of the eastern fields with its typically tight consolidated sandstones. Dr. George said lime formations in California showed an oil recovery of 90 per cent in many instances, while similar pay strata in other areas offered a possible recovery by ordinary methods of 75 per cent at least. Labor, the speaker said, is a large item in oil mining. In foreign operations this factor is comparatively negligible.

Leo Ranney, of the Ranney Oil Mining Patents Corp., discussed advantages in uncovering a large surface of the pay formation. In the Pennsylvania grade oil fields, he said, it would in many cases be possible to tunnel into the sides of hills and obtain good production within 600 feet. The situation in Pennsylvania is not comparable, he said, with that of Pechelbron where the sand is only one meter in thickness. Oil could be mined in certain eastern fields for as little as 50 cents a barrel, he said.

### Porosity and Permeability

Dr. C. R. Fettke, of Carnegie Institute of Technology, pointed out that in some districts, considered to produce from the most uniform sands in the region, there were actually such differences in porosity, and permeability wells ordinarily ready for abandonment could be reworked by exploiting additional sections of the pay streaks. Dr. Fettke recalled that the study of core samples dates from 1924 in the eastern fields, although "sand" and fragments from wells had been examined before that time. The important things to know about the pay sand is the porosity or space available for oil and gas, and the oil content. It was thought at first, he said, virgin sands were 100 per cent oil saturated. Now it is known this is far from the fact.

R. A. Cattell, of the U. S. Bureau of Mines, said interlocking of effort and not overlapping of effort should describe the relation between the oil industry and the agencies of the Government. The latter, he said, is in a position to aid the industry materially and all that is required is a spirit of friendly cooperation and a sense of fairness. These requirements are advanced only by understanding mutually the problems faced by Government and industry.

Wilson K. Page, of Olean Petroleum Corp., described the electrification of his producing properties in the Kaneshoim District where production is from the

Bradford sand. His total production costs he gave as 40 cents a barrel.

Paul D. Torrey, of Torrey, Fralich and Simmons, discussed the effect of dip on water flood control and air-gas repressuring operations. The air and/or gas intake wells should be located on top of the structure, while water pressure wells should be located down dip to be fully effective, Mr. Torrey said.

### Methods of Pumping

J. C. Askam, of the Ohio Oil Co., discussed the latest methods of pumping oil and the equipment involved. Among his subtopics were the following: hydraulic lift, rodless pump, plunger lift, underground electric pump, casing pumping, siphon lift, pneumatic pumping system, rig fronts, powers, prime movers, belts and belt clamps. He discussed the merits of various materials for shooting wells. Importance of accurate bottom hole pressure readings and the various methods and apparatus was stressed.

Russell B. Brown, of the Independent Oil Producers Association of America, said, "An industry that pays as much taxes to Government as oil is surely entitled to some recognition, but you must concern yourself in government." Mr. Brown urged an unbiased view of the Federal Government's position. "We must attack the errors specifically and not Government in general when a planned program such as that of the oil code goes awry. A cool head at this time will enable us to salvage many benefits which grew out of the intensive efforts applied in the past two-year period of supervised co-operation," Mr. Brown said.

### Importance of Michigan

A valuable estimate of the position of the Michigan oil fields and refining facilities in the eastern picture was presented by R. B. Newcombe, of the Michigan Geological Survey. His expectation that the state's production in 1935 will reach 15,000,000 bbls. offers food for reflection by operators in the eastern stripper well areas. The refining facilities of Michigan are rapidly expanding, he said, but most of the plants are small topping units of limited capacity serving local markets. Early in 1935 there were 14 active refineries with a total capacity of about 35,000 bbls. of crude. The amount actually being refined was between 25,000 and 26,000 bbls. daily. Of this about two-thirds was Michigan crude, so that approximately half of the daily output was transported out of the state.

Because of the low anti-knock rating of the straightrun gasoline from Michigan crude, the speaker said, it is common for topping plant operators to cut large percentages of kerosene and naphthas. New plant construction is under way or projected at Plymouth, Pontiac, Lansing, Bay City, and near the new Crystal Pool at Carson City.

### Acid Treatment

In his discussion of acid treatment Mr. Newcombe covered the types of acid, amounts of acid, and methods of introduction into the hole. It is customary, he said, for operators to allow new wells to stand a few days before making a treatment, and then treat the first time with 500 gallons of 15 per cent acid. This allows fluid circulation to become established toward the hole and makes wider acid penetration possible. Later second and third treatments are generally made with 1,000 gallons of acid, or more. The exact economic success of acid treatment, Mr. Newcombe said, is difficult to evaluate, but it seems to stand in the same position for limestone pay horizons as shooting does for sandstone formations.

C. D. Hunter, of the Kentucky West Virginia Gas Co., said results with acid treatment in Kentucky and West Virginia were mixed. In some lines high porosity appeared to show adverse results with acid. In Dolomitic limes production increases often ranged from 200 per cent to over 2,000 per cent. In the Big Lime well in Kentucky, Mr. Hunter said, acid was introduced and allowed to stand in the hole three days. When the clamps were taken off this well, which had been abandoned as depleted, the force of the uprising column of oil blew 1,000 feet of tubing out of the hole.

Wallace B. Gribble, of Hope Natural Gas Co., related similar experiences with acid treatment in the West Virginia lime wells.

Geophysical methods of subsurface exploration were discussed in considerable detail by Frank M. Brewster, of Belmont Quadrangle Drilling Co.; Dr. J. French Robinson, of Peoples Natural Gas Co., and James D. Sisler, of Carnegie Natural Gas Co. Mr. Brewster emphasized the need for proper supervision of data supplied by geophysical methods. In his early work in the south central New York and adjacent Pennsylvania gas fields in Tioga and Potter Counties, he found the organization he had hired to carry on seismographical surveys produced results contrary to known data supplied by well logs. By taking the seismographic data and working out new calculations in the light of known conditions in the region Mr. Brewster was able to determine structure outlines and peculiarities with a small percentage of error.

Dr. Robinson said the best results would probably come from a combination of surface geology and reflection seismograph data in the Appalachian region. With a knowledge of the trend and thickening of the Tully lime, and the fact that this formation gives good results in seismograph work, the mapping of the Oriskany sand proved relatively simple as this phenomenal gas horizon lies directly under the Tully lime. Dr. Robinson said this intelligent use of seismograph data located a fault in the Tioga gas area responsible for many dry wells. The cost of seismograph exploration work Dr. Robinson set at 18 cents an acre in the gas district discussed.

Mr. Sisler said only by means of geophysical methods can the formations below the Bradford sand, for instance, be located. Many factors in the eastern fields, Mr. Sisler said, preclude the use of any method other than those involving reflection of sound waves. Topographic influences, Mr. Sisler added, would probably make the data from gravitational systems largely meaningless and contradictory.

C. P. Parsons, of Haliburton Oil & Gas Cementing Co., was assigned the subject of latest methods of plugging off permeable lenses of saturated or barren sands in water flooding, gas repressuring, gas storage reservoirs, including possibilities of permanent plugging of abandoned gas wells.

He demonstrated that at least one oil and gas well procedure developed and widely used in the west may be applied with good results in the settled production fields of the east. Of particular interest to eastern operators was Mr. Parson's description of simple and comparatively low cost methods of sealing off barren formations which cause waste of air-gas repressuring medium or water in flooding operations. In combination with a recently developed apparatus for firing bullets through casing and into pay formations, Mr. Parsons proposed a system in which cement would encase the liner except at points vented by bullets. The impact of the bullets in the oil sand, Mr. Parsons suggested, might have the effect of a shot without involving the danger of badly fractured stratum. The cost of preparing a 700-foot well in the Oil City district for selective sand streak exploitation Mr. Parsons estimated at about $500. Mr. Parsons described a single stage and a multitude stage method for applying the cement.

It has not been possible to introduce even so fine a material as bentonite into eastern consolidated sands. However, Mr. Parsons said, it is possible that the yield point of certain fluids, sodium sylicate for instance, might be utilized with application pressure of something under 700 pounds per square inch, to seal off barren streaks which waste repressuring or flooding media or rob pay sands.

J. G. Montgomery, Jr., of United Natural Gas Co., discussed the general use of cement in the Oriskany and Tully formation gas wells where pressures in the region of 2,000 pounds are not uncommon. Mr. Montgomery also stressed the possible use of cementing methods in secondary oil recovery.

Frank E. Eckert, of Hanley and Bird, urged that by lowering the cost of well abandonment in the stripper well region, the possibility of poorly plugged wells ruining the pay horizons would be decreased. Instead of the present costly procedure, he said, the well could be cemented above and below the productive strata for abandonment. If it were desired at a later date to rework the well the cement plugs would offer comparatively little difficulty.

Officers and members of the advisory board elected for the 1935-1936 term are as follows:

H. H. Phillips, T. W. Phillips Oil & Gas Co., Butler, chairman; J. C. Askam, Ohio Oil Co., Findlay, Ohio; C. A. Bonine, Pennsylvania State College, F. E. Eckert, Hanley and Bird, Bradford; George Wittmer III, Wittmer Oil & Gas Co., Pittsburgh, vice chairman; Fred Benkert, Peoples Natural Gas Co., Pittsburgh, secretary and treasurer.

Members of the advisory committee are:

Frank Brewster, (chairman), Belmont Quadrangle Drilling Co., Bradford; S. J. Brendel, Penn United Gas Co., Pittsburgh; E. F. Clagett, Pure Oil Co., Saginaw, Mich.; P. H. Curry, South Penn Oil Co., Pittsburgh; Forest D. Dorn, Forest Oil Corp., Bradford; K. C. Heald, Gulf Oil Co., Pittsburgh; S. W. Meals, Carnegie Natural Gas Co., Pittsburgh; J. G. Montgomery Jr., United Natural Gas Co., Oil City; J. H. Newton, Philadelphia Co., Pittsburgh; C. C. Reed, Hope Natural Gas Co., Clarksburg, W. Va.; J. R. Reeves, Cities Service Corp., Elmira, N. Y.; J. French Robinson, Peoples Natural Gas Co., Pittsburgh; Frank Schauer, Equitable Gas Co.; Pittsburgh; F. N. Speller, National Tube Co., Pittsburgh; J. B. Tonkin, Peoples Natural Gas Co., Pittsburgh; Paul D. Torrey, Torrey, Fralich & Simmons, Bradford; Don Wilson, Columbia Gas & Electric Co., New York, N. Y.; R. T. Zook, Sloan & Zook, Bradford.

# Martin Moran, Pipe Line Executive, Passes Away at the Age of 77 Years

Martin Moran, retired president of the Texas Pipe Line Co. of Oklahoma, and one of the grand old men of the oil industry, died at his home in Tulsa Saturday, June 8, after a long period of ill health. He was 77 years of age.

Few men in the industry were better known or more loved and respected than this veteran of nearly 60 years in the oil business.

Mr. Moran was born in Portageville, N. Y., a district which geologically bears

MARTIN MORAN

the same relation to the Pennsylvania oil fields that the Arbuckle Mountains do to the Oklahoma fields. In this place, where the Pennsylvania pay sands outcropped, he spent his boyhood.

While in his teens Mr. Moran started to work at the bottom of the industrial ladder in the Allegany field. He joined the National Transit Co. and became a gauger in the Bradford Field. The rapidly growing Standard Oil Co. kept a close watch for young men of outstanding ability and Moran was one of these, and promotion came steadily as the operations of the great Standard pipe line system expanded.

Mr. Moran was transferred to the Buckeye Pipe Line Co. in Ohio and held positions of responsibility for that company.

When the Texas Co. made plans to extend its pipe line from the Red River to the Glenn Pool in Oklahoma, J. S. Cullinan, president of the company, reached out for Martin Moran and put him in charge of the construction of the line, which, when completed, was one of the three lines that handled all the oil produced in Oklahoma, the others being the Prairie and the Gulf pipe lines.

From superintendent to general superintendent and then president of the Texas Pipe Line Co. of Oklahoma were but steps in the career of this able and hard-working pipeliner. He retained his high office years longer than the average oil executive and retired only when his health began to fail.

Mr. Moran was for years a director of the Central National Bank of Tulsa, and for a short time was a director of the Exchange National Bank when the Central and Exchange banks merged. He was a member of the Knights of Columbus and the Tulsa Country Club.

The writer of this has in the past score of years heard many men tell of the helpfulness and kindness of Martin Moran, and of his practical interest in young men who showed signs of ability and ambition.

The International Petroleum Exposition and Congress of 1929 acclaimed Mr. Moran the Grand Old Man of the Industry.

Mrs. Moran and six sons, one daughter, Miss Marguerite, and eight grandchildren survive. The sons are Daniel J. Moran, president of the Continental Oil Co., New York; William H., superintendent of the Texas Pipe Line Co. of Oklahoma, Tulsa; Edgar F., drilling contractor, Tulsa; Walter B., of the oil producing firm of Crosbie & Moran, Tulsa; John R., attorney for the Continental Oil Co., Denver, Colo., and Joseph A., of the law firm of Hagan & Gavin, Tulsa.

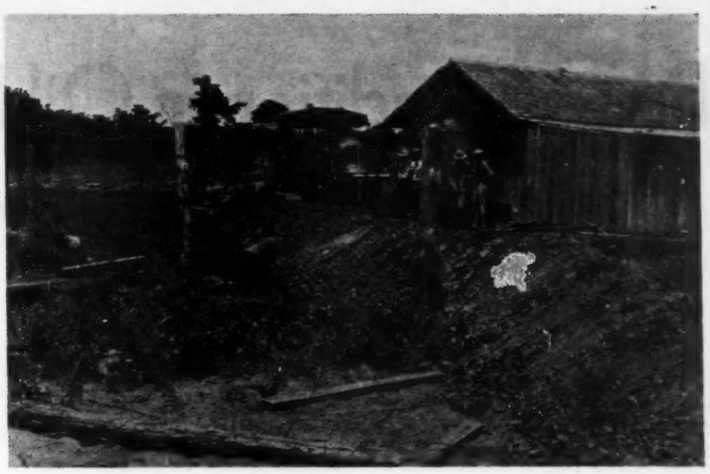
The funeral was held Monday morning, June 10. Services were conducted in Holy Family Cathedral and burial was in the Catholic Cemetery in Tulsa.

## MARACAIBO TO MID-CONTINENT

NEW YORK, June 8.—Maracaibo Oil Corp. whose holdings hitherto have been confined to Venezuela has decided to enter the Mid-Continent and Texas areas aggressively and will purchase acreage. In connection with extension of the company's interests to this country a new and important group have acquired approximately 100,000 shares of the outstanding stock. The company believes an investment of its available cash capital of approximately $285,000, after reserving $50,000 for working capital balance, in producing and prospective royalties and lease interests in oil properties in the Mid-Continent district will present more attractive profit possibilities than would expenditures in development work in Venezuela.

# Stanolind Is Checking and Reconditioning Its Trunk Line in Texas

By L. E. BREDBERG



*Ditching machine cutting new ditch for detour around barn which now sets over a section of the old line. The old line will be pulled out from beneath barn if possible, but new or reconditioned line will be laid in new ditch*

FORT WORTH, Tex., June 10.—The Stanolind Pipe Line Co. is taking up, reconditioning and relaying about 32,000 feet of pipe on its 45-mile 8-inch line from Ranger Station in Eastland County to Graford Station in Palo Pinto County on its Mid-Continent trunk system that delivers oil south to the Gulf Coast and north to Wood River, Ill.

The line from Ranger to Graford has been transporting sour crude from Winkler County, West Texas, but engineers were surprised to find that the sulphur impregnated crude has not caused as much damage to the line as anticipated, especially where there had been leaks and the line had laid in the oil soaked soil. The reason for this possibly is the fact the pipe is buried so deeply that the air cannot reach the oil and pipe and set up corrosion.

A corrosion survey was made of the line with instruments to ascertain the corroded spots and the "hot spots" in the soil. The company has maintained a record of the work it has done in repairing and reconditioning the line and all sleeves, collars and other patched places are being taken out and new line or reconditioned line inserted.

### Course of Line Changed

Where the line passes through some old oil well slush pit, tank farm site or dikes, or through ponds or other places where corrosion might be set up more rapidly in the pipe, the company is changing the course of the line. At one point a house had been built over the line. The house was later used as a barn and the acids from the stable were considered as highly corrosive and would cause trouble in the line, so this part of the line is being removed and detoured around the barn. Polluted streams are also the cause of worry to pipe line men, consequently all creek and ravine crossings are being taken up, whether or not the survey showed corrosion, and the pipe worked over before being relaid. On one bank of the Brazos River a salt water stream from an old abandoned but not plugged oil test is causing corrosion to the line. Consequently repairs and recoating will be done on this part of the line.

*Picture showing section of pipe lying in water in ravine. Collar leak may be seen in rear part of picture, with seepage oil shown in ditch. In such places the collars are cut out, pipe is pulled up and new or reconditioned line laid to replace the old section*

All highway crossings are being taken up and worked over. When pipe is relaid at these crossings it is placed inside of a section of 10-inch pipe used as another form of protection. At each end of the 10-inch a special collar is welded to it. A rubber packing ring is inserted between the welded part of the collar and the free part which is bolted to the welded section, and this rubber packing ring fits down tightly against the 8-inch pipe.

This method of closing both ends of the protective pipe around the 8-inch is used to prevent air, water and other corrosive agents from gaining access to the 8-inch pipe at the crossings, but is flexible enough inside of the rubber packing ring and collar to allow movement of the line pipe inside of the crossing protector. The 8-inch pipe is not doped or covered when so placed within the larger pipe, but the 10-inch protector is coated and wrapped to insure its protection against the elements and corrosion just as the rest of the line is protected.

### Protection for Workmen

When a repair is made in the line this company takes the precaution of shutting down the line until the repair is made. This is done principally for safety to the men working on the line. Before a cut is made the foreman asks that the line be shut down. Suction pumps at the stations are then used to empty the line of its oil. To insure a comparatively dry line before the cut is made, thereby preventing loss and waste of oil and possible danger, a four-cylinder 75-horsepower gas engine driven 9x8 compressor is hooked up with the line by means of a special saddle and contrivance called the Polson plug, designed by a couple of men with the company, and air used to force out any oil that might have accumulated in the line. This compressed air will even force the oil out of the low places in the line where suction pumps may not have been entirely successful in getting out all the oil.

This particular line is screw coupled, therefore when a section is cut out to be reconditioned it may either be cleaned and worked on in the field or taken to the pipe yard and worked over. The collars are taken off, the pipe cut and ends bevelled. When it is relaid it is inserted as welded pipe. If the line is raised anywhere all collars are then welded before it is placed back in the ditch. This is to prevent any leaks that might have been set up around the collars by the strain placed on them in raising and lowering the pipe. If a section of the pipe is in bad shape the section is cut out entirely and new or reconditioned sections used in replacements no matter how long or short the section may be.

*Picture showing ditching machine cutting new and parallel ditch to the old line. A new section of line will be laid in the new ditch to replace the old line*

Such pipe is used where the line has previously been repaired with collars and sleeves. Before new pipe or reconditioned pipe is replaced in the line it is painted with a primer paint. It is then given a single coating of hard Parolite then wrapped with asbestos felt paper which is also coated with hard Parolite after the pipe is wrapped.

The line when first laid, in the latter part of 1918 and the spring of 1919, was not doped or covered, and where leaks have sprung in the line the pipe is generally found to be corroded due to the oil and oily soil standing around the leaky places. Where the line has been half-soled it was found that these types of repairs have not given any trouble, but collars and full sleeves do give trouble. The line was reconditioned or patched about three years ago, but after the present job is completed it is believed that the line will not have to be touched for a long time due to the type of reconditioning and replacement work being done. All highway, stream and ravine crossings are to have the collars welded as an added precaution against breaks and leaks at these junctures of the line.

### Pipe Checked Carefully

When the pipe is taken out of the ground and pit holes and corroded spots show less than 100 mills in depth the pipe is considered Class A pipe. If such spots show more than 100 mills in depth the pipe is spot welded and made into Class A pipe for re-laying unless the corrosion has been of such nature that it has caused sufficient damage to the pipe that same is not worth working over and re-laying.

Some of the pipe traverses heavily wooded and extremely rough country, there being 300 feet of drop in the line at one point in Palo Pinto County. The line has a drop of 400 feet in 4,000 feet, the 300-foot drop falling off within 1,000 feet. This part of the line is laid in limestone, the ditch having been blasted and the line covered with solid rock after it was laid. No corrosion has taken place in this part of the line, consequently it will not have to be disturbed. Practically the entire 45 miles of line lays in soil, much of which is sandy, that is noncorrosive, consequently there is less reconditioning work to be done on this line than on lines which pass through acid or alkaline soils where there are many "hot spots" to give pipe trouble.

## Pioneer Producer in Oklahoma Dies in Tulsa

William L. Norton, who came to Oklahoma in 1905 to operate in the Cherokee Nation fields of Rogers, Nowata and Washington Counties, and who at the time of his death was the owner of several hundred stripper wells in Oklahoma, died suddenly on Saturday, June 8, in Tulsa, where he resided. Heart disease was the cause of death.

Mr. Norton was a native of Wellsville, N. Y. He learned the oil business in the Allentown and Richburg-Bolivar Fields in southwestern New York before coming to the Mid-Continent. He operated on a considerable scale in the Nowata and Bartlesville districts and later in the more southerly fields of the state. For a while he engaged in oil distributing with headquarters in Kansas City.

Mrs. Norton, who lives in Wellsville, N. Y., and one son, Theodore Norton of Washington, D. C., survive. The funeral and burial will be held in Wellsville.

### EUGENE RITTER DIES

FORT WORTH, Tex., June 10.—Eugene Ritter, refinery superintendent for the Magnolia Refining Co., Fort Worth, died in a Fort Worth hospital following an operation.

# Better Condition in Oil Revealed by Analysis of Bureau of Mines

By C. O. WILLSON

The Bureau of Mines report for April shows some improvement over previous monthly reports this year in regard to a better balance between supply and demand for petroleum products in the United States. Due to this development in April, the accumulative data for the first four months of this year as summarized in the accompanying table also reflect a better condition than was apparent in the earlier monthly reports.

The statisticians who have contended that both producing and refinery operations were being maintained at too high levels in view of the current demand can still find support for their position in the latest monthly government report when considered by itself or a part of the first four months' operations. The fact that prices either improved or remained firm during April and May and so far in June, however, indicates that excess of supply over demand for the entire industry has not reached the point where it is a depressing factor in markets. Crude oil production has been in excess of the monthly allocations of the Government, which were based on expected requirements. For the entire country an increase in total demand for all oils of 2 per cent as shown in accompanying table has been more than offset with an increase of 7.7 per cent in total supply. This situation has resulted in an increase in stocks of all oils of 5,400,000 bbls. since the first of the year.

Those who minimize the significance of these data showing the excess supply point to the fact that stocks of crude oil and most of the refinery products on April 30 were still less than on the same date in 1934, with the assumption that the industry is in a position to absorb additional supplies through storage programs if necessary without danger to the present market structure. Other observors with the same data available contend a better balance between supply and demand in the future is necessary to avoid trouble later in the year.

### Gasoline Demand Increases

Those who stress the favorable factors in the present oil situation are pointing to the gain in domestic gasoline demand in April over March and also April, 1934. The April domestic demand, based on refinery shipments, was 36,076,000 bbls., an all-time record for that month and a gain of 10 per cent over April of the previous year. Due to this large gain in April the accumulative increase for the year has increased with a gain of 4.1 per cent over the first four months. This is in excess of the indicated increase earlier in the year and definitely points to a record gasoline consumption during the main consuming season this summer and early fall. This gain in domestic gasoline demand obviously has been a factor in absorbing the increase in domestic crude oil production of 7.8 per cent for the first four months. The gain in domestic gasoline shipments of 4,840,000 bbls. for the four months as shown in the table, when translated into crude oil with an average yield of 46.3 per cent, means an additional demand for crude oil of 87,000 bbls. daily.

Unfortunately the industry has not obtained the full benefit of this increase in domestic gasoline demand due to a continued decline in exports which decreased 1,794,000 bbls. the first four months. In this connection press reports which have stated that refiners in this country are enjoying the heaviest gasoline demand in their history are erroneous. The domestic demand is greater than the same period in any other year but not the total demand. The largest total gasoline demand in this country was in 1930. In that year the gasoline exports for the first four months were 22,474,000 bbls. The exports for the same period this year were one-third this figure. Due to this large decline in export business, the total demand (domestic demand plus exports) this year is 91 per cent of the peak year of 1930. Gasoline exports in April averaged 49,000 bbls., which compares with 84,000 bbls. in March and 91,000 bbls. in April, 1934.

### Gas Oil and Fuel Oil

The data on supply and demand for gas oil and fuel oil also point to a favorable situation. Despite the increase in crude runs to stills, refiners in this country drew on their stocks for over 20,000,000 bbls. to take care of the demand for the first four months. The total demand was practically the same as in 1934 when it was also necessary to draw on storage. This situation has tightened the market for the heavier fuels in practically all refining centers and has been the most important factor in preventing a large accumulation of total oil stocks the first four months of this year.

Among the less important refinery products the report at the end of April shows that kerosene did not occupy as strong a position as it did a year ago with a gain of 43 per cent in stocks. Refiners in this country have lost some important kerosene business to foreign refiners. Due to this fact the total demand has been less with a 9.3 per cent increase in production. The lubricating oil situation has been in balance so far as total supplies and demand are concerned. Available information indicate that supplies of certain oils has been excessive. The available supply of wax, while less than the same period in 1934, is still in excess of the current demand, according to the April report.

## Crude Oil and Refinery Situation Summarized—First Four Months, 1935-1934

**Supply and Demand—Crude Oil (Bbls.)**

| First four months— | Total supply | Total demand | Excess Demand | Excess Pct. | Domestic production | Imports¶ | Indicated domestic demand‡ | Exports | Stocks refinable crude April 30 |
|---|---|---|---|---|---|---|---|---|---|
| 1935 | 317,843,000 | 315,304,000 | *2,539,000 | *.7 | 311,393,000 | 6,450,000 | 303,074,000 | 12,230,000 | 339,793,000 |
| 1934 | 298,995,000 | 298,950,000 | *45,000 | .01 | 288,770,000 | 10,225,000 | 287,627,000 | 11,323,000 | 354,350,000 |
| Increase, 1935 | 18,848,000 | 16,354,000 | ..... | .... | 22,623,000 | †3,775,000 | 15,447,000 | 907,000 | †14,557,000 |
| Increase, 1935 | 6.3% | 5.5% | ..... | .... | 7.8% | †36.9% | 5.3% | 8.0% | †4.1% |

**Supply and Demand—Refinery Products—Motor Fuels (Bbls.)**

| First four months— | Total supply | Total demand | Excess Demand | Excess Pct. | Domestic production | Imports | Domestic demand | Exports | Stocks April 30 |
|---|---|---|---|---|---|---|---|---|---|
| 1935 | 142,038,000 | 130,001,000 | *12,037,000 | *9.2 | 142,038,000 | ..... | 122,567,000 | 7,434,000 | §63,814,000 |
| 1934 | 133,269,000 | 126,955,000 | *6,314,000 | *4.9 | 133,268,000 | 1,000 | 117,727,000 | 9,228,000 | §65,608,000 |
| Increase, 1935 | 8,769,000 | 3,046,000 | ..... | .... | 8,770,000 | ..... | 4,840,000 | †1,794,000 | †1,804,000 |
| Increase, 1935 | 6.5% | 2.4% | ..... | .... | 6.5% | ..... | 4.1% | †19.4% | †2.7% |
| **Kerosene** | | | | | | | | | |
| 1935 | 19,342,000 | 18,854,000 | †487,000 | *2.5 | 19,342,000 | ..... | 16,606,000 | 2,248,000 | 6,886,000 |
| 1934 | 17,691,000 | 19,426,000 | 1,735,000 | 8.9 | 17,691,000 | ..... | 16,271,000 | 3,155,000 | 4,822,000 |
| Increase, 1935 | 1,651,000 | †572,000 | ..... | .... | 1,651,000 | ..... | 335,000 | †907,000 | 2,064,000 |
| Increase, 1935 | 9.3% | †2.9% | ..... | .... | 9.3% | ..... | 2.0% | †28.7% | 42.8% |
| **Gas Oil and Fuel Oil** | | | | | | | | | |
| 1935 | 109,360,000 | 130,019,000 | 20,659,000 | 18.9 | 105,856,000 | 3,504,000 | 122,328,000 | 7,691,000 | 97,727,000 |
| 1934 | 105,941,000 | 129,506,000 | 23,565,000 | 22.2 | 105,155,000 | 786,000 | 120,299,000 | 9,207,000 | 106,041,000 |
| Increase, 1935 | 3,419,000 | 513,000 | ..... | .... | 701,000 | 2,718,000 | 2,029,000 | †1,516,000 | †8,314,000 |
| Increase, 1935 | 3.2% | .4% | ..... | .... | .6% | 345.0% | 1.6% | †16.4% | †7.8% |
| **Lubricating Oil** | | | | | | | | | |
| 1935 | 8,763,000 | 9,068,000 | 305,000 | 3.5 | 8,763,000 | ..... | 6,273,000 | 2,795,000 | 7,026,000 |
| 1934 | 8,537,000 | 8,771,000 | 234,000 | 2.7 | 8,537,000 | ..... | 6,036,000 | 2,735,000 | 6,796,000 |
| Increase, 1935 | 226,000 | 297,000 | ..... | .... | 226,000 | ..... | 237,000 | 60,000 | 230,000 |
| Increase, 1935 | 2.6% | 3.3% | ..... | .... | 2.6% | ..... | 3.9% | 2.2% | 3.4% |
| **Petroleum Wax (Lbs.)** | | | | | | | | | |
| 1935 | 161,346,000 | 153,553,000 | *7,793,000 | 5.0 | 152,600,000 | 8,746,000 | 82,763,000 | 70,790,000 | 144,153,000 |
| 1934 | 186,306,000 | 164,880,000 | *21,426,000 | 13.0 | 168,280,000 | 18,026,000 | 93,301,000 | 71,579,000 | 91,763,000 |
| Increase, 1935 | †24,960,000 | †11,327,000 | ..... | .... | †15,680,000 | †9,280,000 | †10,538,000 | †789,000 | 52,390,000 |
| Increase, 1935 | †13.4% | †6.8% | ..... | .... | †9.3% | †51.4% | †11.3% | †11.0% | 57.1% |

*Excess supply. †Decrease. Note—Total supply equals domestic production plus imports. Total demand equals domestic demand plus exports. Data on demand for refined products are based on refinery shipments. ‡Crude oil only. §Includes natural gasoline. ¶For domestic use.

**Crude Oil Runs to Stills and Total All Oils (Bbls.)**

| First four months— | Total imports§ | Total exports§ | Total crude to stills | Nat. gasoline production | % Gasoline yield from crude oil‡ | Total supply all oils* | Total demand all oils* | Stocks all oils April 30 |
|---|---|---|---|---|---|---|---|---|
| 1935 | 10,099,000 | 33,340,000 | 297,969,000 | 12,517,000 | 46.3 | 341,134,000 | 335,744,000 | 569,538,000 |
| 1934 | 11,118,000 | 36,473,000 | 283,352,000 | 11,764,000 | 46.1 | 316,523,000 | 328,941,000 | 589,795,000 |
| Increase, 1935 | †1,019,000 | †3,133,000 | 14,617,000 | 753,000 | .... | 24,611,000 | 6,803,000 | †20,257,000 |
| Increase, 1935 | †9.1% | †8.6% | 5.1% | 6.4% | .... | 7.7% | 2.0% | †3.5% |

*Total all oils includes crude refined products, natural gasoline and benzol. †Decrease. ‡Includes natural gasoline blended at refineries. §Includes crude oil and refinery products. In case of gas oil and fuel oil and wax, imports includes only products for domestic use. All data based on Bureau of Mines reports.

# Short Term Leases Speeding Development in Port Lavaca Field

By F. L. SINGLETON

PORT LAVACA, Tex., June 10.—The expiration of short term leases and a desire by the operating companies to outline the structure of the Port Lavaca field in northern Calhoun County quickly, has caused an unusual extensive development program. While the structure was proven for distillate production in November by completion of Steen Drilling Co.'s (now Halliburton Oil Producing Co.) No. 1 Stanzel, it was not until April that the field got its first oil production, when Steinberger Petroleum Co. completed No. 1 Shofner for an initial production of 574 bbls. of 41.3 gravity per day.

Situated about 2 miles west of Lavaca Bay and the same distance north of the town of Port Lavaca, the first leasing activity was started in the fall of 1933, by R. F. Weichert of Houston who assembled 1,500 acres, later acquired by W. A. Williams through Joe Compton and C. O. Polk, who completed the block of 5,300 acres. An attempt was made to sell by the block on bottom hole acreage, but due to lack of geological work no deal was consummated until the area was worked by Ralph M. Sturm, using surface geology based on the correlation of water wells.

A half interest in the block was turned to Steen Drilling Co. for $15,000 bottom hole money and a total of 2,600 acres checkerboarded. The company contracted to drill a 6,000-foot test, and after a careful study of a torsion balance survey map made in 1925, the company moved in material for No. 1 Stanzel, on a 40-acre lease in the A. Espaza Survey, just off the apex of the dome.

Actual drilling commenced in September, 1934, and at the contract depth of 6,000 feet, after encountering only a few small gas shows between 3,170-3,272 feet and 4,146-60 feet, the operators decided to drill deeper in face of reports that the well was too low structurally. The Marginulina, the producing horizon, was topped at 5,983-6,007 feet, and at 6,158 feet, with 7-inch casing cemented at 6,120 feet, it was completed on November 25 for an initial production of 35 bbls. of distillate per day through a three-eighths inch choke, with tubing and casing pressure equalized at 2,300 pounds.

### Development Starts

While the completion of the test proved the structure productive, no real development was started until after Steinberger Petroleum Co. completed No. 1 Shofner for a good producer at 6,238 feet. This test was started after Texas Co., which held approximately 11,000 acres, mostly west of the Stanzel test, and acquired by the company in 1929 and 1930 after it had been worked with geophysical instruments, made a deal with Steinberger Petroleum Co., whereby the company received a 100-acre lease for the drilling of a test to the horizon of the discovery well. Location was made approximately 1,600 feet northwest of Steinberger company's test in the M. Sanches Survey. After the distillate sand found in the discovery was cored from 6,086-6,216 feet, the operators decided to drill deeper and encountered saturated oil sand from 6,216-38 feet, total depth, where it was completed for an initial production of 574 bbls. of 41.3 gravity oil per day, flowing through a one-quarter inch choke, with tubing pressure 1,050 pounds and casing pressure 1,350 pounds.

The completion of a producer perpetuated approximately 2,900 acres of Texas Co.'s leases, and started the present development. To perpetuate many of the leases due to expire within a short time, Texas Co. moved in material for four tests and took out permits to drill 15 more. The four locations were from 1 to 5 miles in a southwesterly direction from the discovery, and to date this widespread activity has practically defined the west and southwestern limits. Out of the four tests only one has been completed as a producer, one has been abandoned, and two which have shown nothing of importance will no doubt be abandoned.

The first failure was the abandonment of Texas Co.'s No. 1 Blardone, 2 miles southwest of the discovery in the Samuel Shupe Survey, abandoned at 7,402 feet, after coring salt water sand from 6,961-78 feet. While the company's No. 1 A. and A. F. Martin, most southwesterly test, approximately 5 miles southwest of production, has not been officially abandoned, it is being looked upon as a dry hole, as it is below 7,400 feet and has shown nothing of importance. While the south and southwestern limits of the structure were being defined, another failure was recorded to the northwest by abandonment of Adrian Moore's No. 1 McMaster at 6,292 feet, after it had shown mud and salt water on a drill stem test from 6,234-86 feet.

### Production Extended

Although Texas Co. extended production approximately 1½ miles southwest by completion of No. 1 Wehmeyer in the M. Sanches Survey, the producing limits are not expected to be extended much further in this direction, due to the performance of the well. After being drilled to 6,333 feet, it was plugged back to 6,261 feet where it was completed for an initial production of 155 bbls. per day, and while it is making its allowable of 150 bbls. per day, it is flowing by heads under a small gas pressure which does not compare favorably with the other three producers. That production will not be extended much further is brought out by the company's No. 1 Charles Geryk, about 2,000 feet west, which encountered salt water sand below 6,428 feet and will probably be abandoned.

With the southwest, west and northwest limits fairly well defined, the producing area may seem to be confined to a rather small area. The Wehmeyer test is on the extreme western edge of the structure, with the contour lines extending just below the McMaster test in a northeasterly direction, taking in parts of the Pedro Gonzales Survey to the northeast, and extending in a circle that takes in a part of the Lavaca Bay. Assuming the torsion balance survey to be correct, the trend of the field is expected to develop into an oval shape like many of the salt dome structures.

The prospects of the northern limits becoming productive will probably be known within a few days as Texas Co.'s No. 1 Duelberg, is being prepared for a test. It is bottomed at a plugged back depth of 6,246 feet and is reported to be structurally higher than Steinberger Petroleum Co.'s No. 1 Shofner, 1 mile southwest.

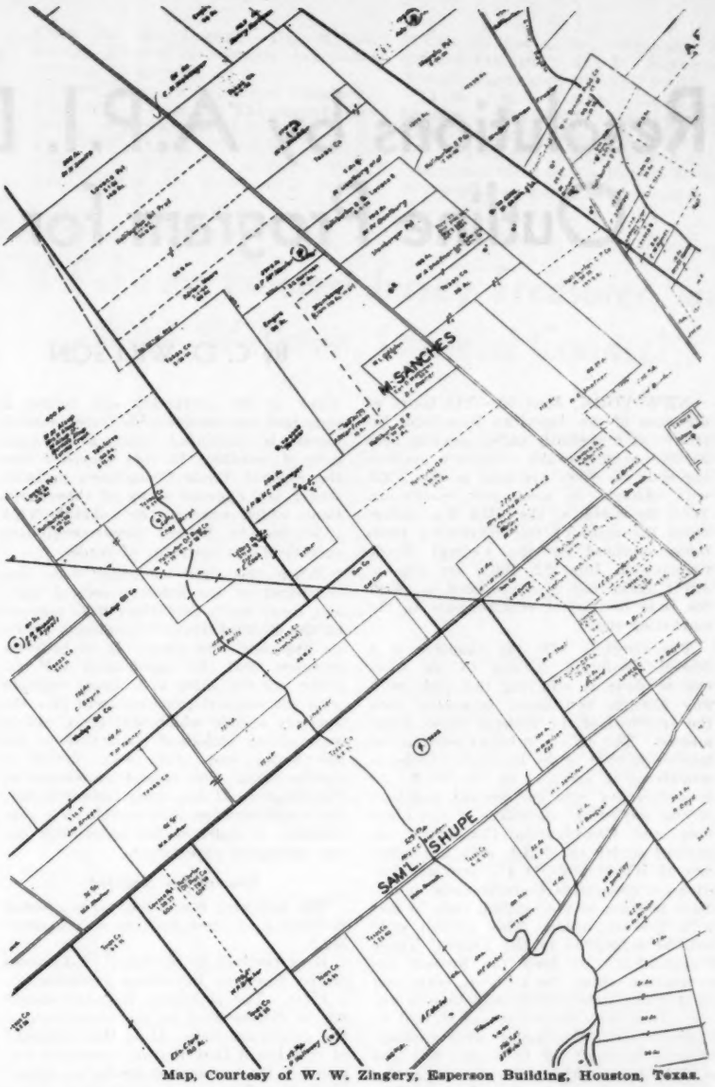
Considerable acreage remains to be drilled. Based on the present development, it has been conservatively estimated approximately 3,600 acres will be proven productive, of which 2,600 acres will be on land and the other 1,000 acres submerged land in the Lavaca Bay. If production is extended to the bay, development of the submerged land will no doubt be done by directional well drilling, as most of the bay is oyster beds and is not expected to be offered for lease by the State. The acreage along the bayshore is leased by various companies.

### Core Records

The core records indicate that the producing sand body will be uniform, with the top of the producing horizon found slightly below 6,200 feet, overlapped by a gas sand encountered slightly below 6,100 feet. The largest sand encountered in any of the wells completed was cored in Halliburton Oil Producing Co.'s No. 1 Burton, stopped in the sand at 6,262 feet where it was completed as the best well in the field, flowing 80 bbls. per hour. The oil sand was picked up at 6,216 feet and was cored to its present depth, while the gas sand was topped at 6,124 feet.

While Steen Drilling Co.'s No. 1 Stanzel was completed for a high pressure gas well it has been the most profitable completion. Since it has been furnishing fuel to drilling wells, the gas pull has increased its output of high gravity distillate to 100 bbls. per day, being sold to Morris Brothers of Ganada in Jackson County for $1.20 per barrel, whereas the posted price for the field is 80 cents per barrel. Shortly after the well was completed, the operators formed the Lavaca Oil & Gas Co. and were granted a franchise to furnish gas to the town of Port Lavaca, which will also increase the revenue of the well.

The production from the three producers is being taken by Texas Pipe Line Co., which has a short gathering system throughout the field. The oil is run to the company's loading rack at Port Lavaca and shipped by tank car to the company's refinery at Houston. Surveys have been completed by Texas Pipe Line Co. for a trunk line out of the field, but construction will no doubt be held until production justifies.




Map, Courtesy of W. W. Zingery, Esperson Building, Houston, Texas.

***Map of the Port Lavaca Field, Northern Calhoun County, Texas, showing the present activity in the field. The active outpost tests and the two dry holes recently completed are indicated by a circle***

### MR. MINOR KILLED IN WRECK

Lawrence L. Minor, Jr., director and sales manager of Spang, Chalfant & Co., Inc., died May 29 in Pittsburgh, Pa., from injuries suffered in an automobile accident. Mr. Minor was born in Uniontown, Pa., was educated at Virginia Military Institute, and at 22 entered the service of the Spang organization, working his way up from the mill.

# Resolutions by A.P.I. Directors Outline Program for Oil Industry

By C. O. WILLSON

NEW YORK, June 10.—The board of directors of the American Petroleum Institute at a specially called meeting here decided to revive the voluntary marketing code in effect previous to the NRA with changes to meet new conditions. With the ending of the NRA it is understood the rules of fair marketing practices approved by the Federal Trade Commission June 12, 1931, are now in effect again and it is proposed to adapt the code to present requirements in the marketing end.

The directors with the adoption of a formal resolution decided to see what can be done in applying this code with any changes considered necessary with the approval of the Federal Trade Commission. The action in effect returns the marketing code to the Institute which administered it previous to the NRA. As a preliminary step the present members of the marketing committee of the Planning and Coordination Committee, organized under the NRA with headquarters at Washington, D. C., were appointed as a committee to recommend immediate revision of the original code in line with present needs. This revised code will be submitted to the Federal Trade Commission. To keep the present organization intact, the regional, state and local committees which have been working under the direction of the P. and C. Committee at Washington were appointed committees of the Institute's Division of Marketing which will administer the voluntary code as finally adopted. The general committee appointed to make the investigation will report its recommendations to the board as quickly as possible after conference with the Federal Trade Commission.

### Interstate Compact

The board meeting lasted all day and was attended by approximately 50 directors from all sections of the country except the West Coast. The directors in another resolution asked for action on other matters considered necessary for continued stability in the oil business with the ending of the government's sponsored program under the NRA. The resolution asked for a continuance of NRA wages and hours of employment and other practices which have proved their value to the industry.

The directors also urged the immediate ratification of the interstate compact by Congress. This compact has been approved by five oil-producing states and can be made effective as soon as ratified by Congress and the President. The U. S. Bureau of Mines was also asked to estimate the quantities of crude oil required to satisfy domestic and export demands, this information to be furnished to the Interstate Compact Commission and to conservation authorities of the oil-producing states as a guide for allocating current production. The bureau would be asked to make recommendations as to the necessary production. The resolution adopted also calls for the limitation of imports in some proper ratio to domestic production. The directors believe the Connally act should be made permanent.

Most of the discussion at the board meeting centered on the desirability of a voluntary marketing code. Although there were many objections to the NRA code during the period that it was effective, many in the marketing end believe it contained certain desirable features which should be continued under a voluntary code if possible. It was conceded that the Federal Trade Commission probably would not approve many of the regulations which were a part of the NRA code due to federal laws prohibiting agreements in restraint of trade.

When the first voluntary code was submitted by the industry several years ago, many of its provisions were dropped by the Federal Trade Commission before its approval was given. It is believed, however, that the commission will approve certain rules and these, together with the original practices, will give the industry a code which will be of aid in maintaining stabilized conditions in the distribution end. Just what action is finally taken will depend on events at Washington. It has been indicated that the administration is favorable to a continuance of codes so far as possible under voluntary agreements.

### Resolutions Adopted

The following resolutions were adopted pertaining to these matters at the meeting:

Be it resolved by the board of directors of the American Petroleum Institute:

First. The petroleum industry should not be disconcerted by the dissolution of the petroleum code. It is the judgment of this board that the oil companies engaged in the business of producing, transporting, refining and marketing petroleum and its products should observe those rules of fair practice which they have learned from experience are sound and wholesome, make for stability and serve the public interest. This done, there is no ground for apprehension.

This board unanimously urges all those engaged in the industry to refrain from the employment of child labor, and to maintain present wages and hours of labor.

It is the opinion of the board that continued observance of the principles and procedure stated, and the adoption of the program hereinafter set forth will afford the necessary co-operation between the industry and the federal and state governments, insure the conservation of the nation's petroleum reserves and provide the public with a plentiful supply of gasoline and oil of good quality at reasonable prices, and at the same time enable the industry to contribute its rightful share to the speedy recovery by the nation from the prolonged depression.

Second. The board of directors advises the industry to unite in urging prompt action by the Congress:

(a) Consenting to the interstate oil compact already approved by the legislatures of five of the principal oil-producing states, and directing the U. S. Bureau of Mines in aid of the oil-producing states to estimate currently the quantity of crude oil necessary for the country as a whole and for each state to produce to meet the current demand for domestic consumption and exports of petroleum and its products and to make its forecasts available to the Interstate Compact Commission and the respective conservation authorities of the oil-producing states and to the petroleum industry;

(b) Authorizing the President to limit imports in some proper ratio to domestic production for such a period of time as may be necessary.

Third. That the existing Connally Act (which expires June 16, 1937), should be made permanent and that those engaged in the industry should co-operate in every appropriate way with the federal agency in a rigid enforcement of said act.

Fourth. That those engaged in the industry should co-operate in every appropriate way with the state conservation authorities in the adequate enforcement of existing state laws for conservation of petroleum.

Fifth. That the petroleum industry should unite in opposing any further federal legislation providing for regulation of any branch of the industry except as above specifically stated.

Sixth. The U. S. Bureau of Mines is hereby requested to estimate currently the quantity of crude oil necessary for the country as a whole and for each state to produce to meet the current demand for domestic consumption and exports of petroleum and its products and make its forecasts available to the respective conservation authorities and the oil-producing states and to the petroleum industry.

### Second Resolution

The second resolution follows:

The Federal Trade Commission procedure provides opportunity for the continuation of a voluntary code with respect to marketing operations. The rules of fair trade practice authorized by the commission on June 12, 1931, known as the Federal Trade Commission Code, are still in effect. It is, therefore,

Resolved, that the present members of the marketing committee of the Planning and Coordination Committee be appointed a committee to recommend revision of the earlier code immediately to bring it into agreement with those marketing practices which are recognized by the industry as fair and equitable so far as this may be lawfully done and with the approval of the Federal Trade Commission, and that in the meanwhile the regional, state and local code marketing committees of the Planning and Coordination Committee be and they are hereby appointed also committees of the division of marketing of the American Petroleum Institute.

Be it further resolved, that the committee so appointed report its recommendations to the board of directors of the American Petroleum Institute after conference with the Federal Trade Commission.

### Directors Present

The following American Petroleum Institute directors were present: C. B. Ames, Texas Co.; C. E. Arnott, Socony-Vacuum Oil Co., Inc.; T. H. Barton, Lion Oil & Refining Co.; Amos L. Beaty, Phillips Petroleum Co.; Paul G. Blazer, Ashland Refining Co.; C. M. Boggs, Kanotex Refining Co.; W. R. Boyd, Jr., American Petroleum Institute; E. R. Brown, Magnolia Petroleum Co.; J. A. Brown, Socony-Vacuum Oil Co., Inc.; D. S. Bushnell, Northern Group of Pipe Lines; Axtell J. Byles, American Petroleum Institute; F. R. Coates, Henry L. Doherty & Co.; J. D. Collett, O'Keefe & Collett; O. D. Donnell, Ohio Oil Co.; W. S. Farish, Standard Oil Co. (New Jersey); W. H. Ferguson, Continental Oil Co.; W. S. Fitzpatrick, Consolidated Oil Corp.; H. R. Gallagher, Consolidated Oil Corp.; T. B. Gregory, Manufacturers Light & Heat Co.; Benjamin F. Harris, Oil Well Supply Co.; George A. Hill, Jr., Houston Oil Co. of Texas; W. T. Holliday, Standard Oil Co. (Ohio); W. M. Irish, Atlantic Refining Co.; A. Jacobson, Amerada Petroleum Corp.; H. T. Klein, Texas Co.; John M. Lovejoy, Seaboard Oil Co. of Delaware; B. L. Majewski, Deep Rock Oil Corp.; L. L. Marcell, Socony-Vacuum Oil Co., Inc.; P. M. Miskell, Empire Oil & Refining Co.; J. Edgar Pew, Sun Oil Co.; J. Howard Pew, Sun Oil Co.; W. S. S. Rodgers, Texas Co.; Charles F. Roeser, Roeser & Pendleton, Inc.; E. G. Seubert, Standard Oil Co. (Indiana); E. L. Shea, Tide Water Oil Co.; E. W. Sinclair, Consolidated Oil Corp.; H. F. Sinclair, Consolidated Oil Corp.; W. G. Skelly, Skelly Oil Co.; E. L. Smith, E. L. Smith Oil Co., Inc.; W. E. Smith, Standard Oil Co. of Kentucky; Charles L. Suhr, Pennzoil Co.; Oscar Sutro, Standard Oil Co. of California; W. C. Teagle, Standard Oil Co. (New York); R. G. A. van der Woude, Shell Union Oil Corp.; H. C. Wiess, Humble Oil & Refining Co.

The following also attended the meeting: P. J. Hurley, former Secretary of War; H. D. Frueauff, Henry L. Doherty & Co.; W. D. Loucks, Barnsdall Oil Corp.; L. S. Wescott, Pure Oil Co.; Dan T. Pierce, Sinclair Refining Co.; L. L. Stephens, Standard Oil Co. (Indiana); O. H. Price, Atlantic Refining Co.

# Overproduction in East Texas Is Down; Testing Sale of Confiscated Oil

By L. E. BREDBERG

FORT WORTH, Tex., June 10.—There were no more sales of confiscated oil by the State this week, the sale of 100 cars last week for 40 cents per barrel causing a considerable furore in the industry in Texas, because it was made without publishing that the oil was to be sold, and without selling it at public auction to the highest bidder. Several suits have been filed contesting the constitutionality of the new law authorizing confiscation of illegally produced oil, to be heard by a three-judge Federal Court at Austin. The test involves an estimated 3,000,000 bbls. of oil and oil products in storage, and possibly other millions of barrels of oil that might be produced by operators with intention of having it confiscated and sold at auction for what they can get.

Gus Pierce, W. A. Fagan and E. Holmes, Acme Refining Co., Gladewater, Basil Jay and S. J. Gentry, Riverside Refining Co.; William H. McKean, McKean Fuel Oil Co.; C. Savage, American Refining Co.; and M. S. Johnson and George Casey, Jumbo Refining Co., are plaintiffs. They also contend that constitutional search and seizure inhibitions were violated by officers stopping trucks and demanding to see transportation papers.

The question of what action is to be taken by the Federal Tender Board on applications for tenders on oil confiscated by the State of Texas and sold has been referred to Washington. The reference was made after Roger Lacy purchased 91,000 bbls. of confiscated oil from the State and sold it to La Pren Refining Co., and applied for a tender on the oil.

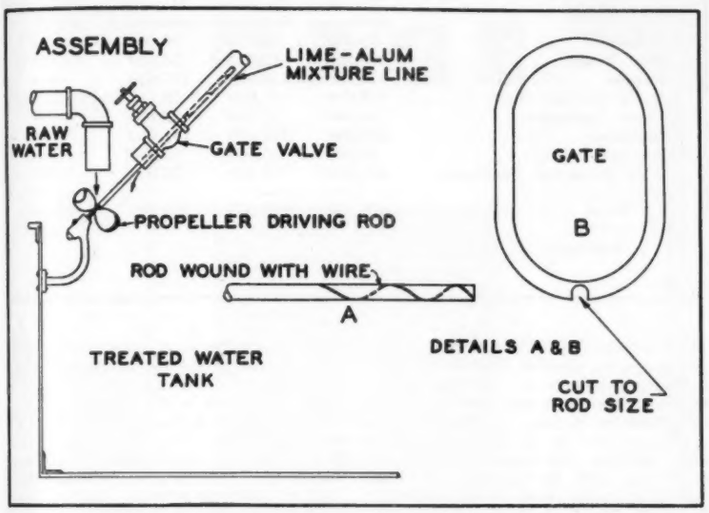
(Continued on Page 32)

# Simple and Inexpensive Gadget Keeps Flow of Lime Solution Uniform

By W. T. ZIEGENHAIN

A simple, inexpensive stirring device has solved an aggravating water treating problem at the Bristow, Okla., refinery of the Marathon Oil Co. and the principle could find similar application in a number of other places. The problem might have been removed by installing more expensive proportioning equipment or major revisions might have been made in the treating equipment to eliminate the problem, but the effectiveness of the little device has removed the need for either and has proved practical over a long period of use.

The problem was that of keeping a constant flow of treating chemicals coming from an overhead mixing tank. The chemicals, lime and alum, are stirred and dissolved in the conventional manner in an elevated tank equipped with a motor-driven stirring device and from here the solution gravitates through a 1½-inch pipe set at an angle of about 45 degrees and so located as to allow the chemicals to drop into the treating tank where the raw water enters. These practices are conventional but difficulty was introduced into the Marathon installation when a proportioning valve was set in the chemical solution feed line going to the treating tank. This valve is needed to keep a definite quantity of chemicals coming into the treating tank and the quantity must be proportional to the quantity and hardness of the water. Since both of these factors remain constant the matter of hand control by use of a valve appeared simple.




However, when the system was installed it was found that lumps of lime would segregate in the pipe in front of the valve and over a relatively short period of operation, the flow of chemicals would cease. It remained for the operators to design an agitating device to keep these lumps of lime from collecting at the valve. It should also be mentioned that the trouble occurred even though the lime was run through sieves and judged free of lumps.

The agitator consists essentially of a Ford fan assembly, a steel rod, a spiral of heavy wire and a support. The assembled parts are shown in the accompanying dingram. The support for the bearing housing may be arranged to provide any angle for the axis or it may be set on a friction joint. This is a matter of local choice, the principal item being the accuracy of alignment where the three-eighths inch steel rod is welded onto the fan axis.

A heavy iron wire is wrapped as a spiral around the rod in a direction which depends upon the rotation of the fan when in place. The wire should be welded to the rod so as to work the lumps downward through the valve when rotating and the effect will be to crush any particles that may accumulate ahead of the valve.

In order to reduce the flow of chemicals to a very small quantity it was necessary to drill the gate in the valve to fit over the rod as shown in detail B. As a result, the valve cannot be closed tightly but if it is desirable to arrange the system so that the chemicals may be completely shut off at any time, it is an easy matter to insert a valve in the feed line ahead of the rod.

In operation, there is a tendency for the rod to pound against the valve, and this should be avoided. Obviously, little power is needed to rotate the rod and the fan blades should be set so that a relatively small part of the incoming stream falls upon the blades.

This idea might be applied in principle to moving sludge, earth or chemicals through a valve. It will require local development as each application is made and might include driving the rod with an electric motor, but in any event, the Marathon installation proves that the scheme is practical.

## Pennsylvania Grade Crude Oil Association Program

OIL CITY, Pa., June 10.—The program for the twelfth annual meeting of the Pennsylvania Grade Crude Oil Association at State College, Pa., June 20 and 21, has been announced by J. E. Moorhead, executive secretary, as follows:

Thursday, June 20, 9:00 a.m.—Registration, Nittany Lion Inn; tour of laboratories and other college buildings.

1:00 p.m.—(Nittany Lion Inn): Luncheon, President T. P. Thompson, Jr., presiding. Address of Welcome, Dr. Ralph D. Hetzel, President, Pennsylvania State College. Response, J. E. Moorhead, executive secretary.

2:30 p.m.—(Mineral Industries Building): "The Past Year"—President T. P. Thompson, Jr.; "A Bigger Future for Pennsylvania Petroleum"—Dr. D. S. Cryder, in charge of Department of Chemical Engineering. "Production Research vs. Field Engineering"—Dr. Gerald Hassler, Department of Petrolem and Natural Gas Engineering.

6:30 p.m. (Nittany Lion Inn): Dinner, Daniel J. Sweeney, presiding. "What the Research Program Has Meant to the Pennsylvania Oil Industry"—Dr. Cary R. Wagner, chief chemist, Pure Oil Co. "Hopes for the Future and Facts for the Present"—Dr. M. R. Fenske, director of research, Petroleum Refining Laboratory.

Friday, June 21 (Mineral Industries Building) 9:00 a.m.:"The Great Unknown in Lubricating Oil"—Prof. H. A. Everett, Department of Mechanical Engineering. "Solving the Jobber's Problems"—Kenneth C. Baker, J. D. Streett & Co., St. Louis, Mo. "Practical Production Problems"—C. B. McClintock, consulting geologist, Oil City, Pa.

12:30 p.m. (Nittany Lion Inn): Luncheon, Charles L. Suhr, presiding. Report of Nominating Committee. Election of Directors. Report of Resolutions Committee. "Remarks"—Fayette B. Dow, vice president and general counsel.

# R. P. Resor Elected Jersey Treasurer, and Guy Wellman, General Counsel

By C. O. WILLSON

NEW YORK, June 10.—At a meeting of the board of directors of the Standard Oil Co. (New Jersey) following the annual meeting, changes were made in the company's officers necessitated in part by retirement of Christy Payne as vice president and treasurer. C. O. Swain, who has been a director and general counsel for several years, was elected a vice president. R. P. Resor, assistant treasurer, was elected treasurer. Guy Wellman, associate general counsel, was elected general counsel, succeeding Mr. Swain.

Orville Harden, recently elected a vice president and who is also a director, was made a member of the executive committee. The executive committee consists of W. C. Teagle, president; W. S. Farish, chairman of the board, and Messrs. Swain and Harden. As previously announced T. C. McCobb, comptroller, was elected to the board of directors taking the place left vacant by Mr. Payne.

At the annual meeting it was explained by Mr. Swain in answer to an inquiry that the company has no present intention of invading the Standard Oil Co. (Indiana) marketing territory as a major distributor. He explained the recent opening of two Esso stations in St. Louis followed long negotiations with the Standard Oil Co. (Indiana) through which it was hoped the latter company would handle some of the New Jersey company's products. He indicated his company was principally interested in making its marine products available to that trade along the Great Lakes and the Mississippi River. When negotiations with the Indiana Standard proved futile it was decided to open the stations at St. Louis which resulted in the recent suit of the Indiana Standard claiming the use of the name Esso constitutes an infringement of the name by which its own products are known.

### Earnings About Same

It was stated at the annual meeting that earnings of the company so far this year have been running about the same as last year. The earnings last year averaged about $3,750,000 monthly.

T. C. McCobb, newly elected director, who will be 52 years of age in August, was a bill clerk with the Erie Railroad from 1900 when he left high school at Cochranton, Pa., to 1902. At the end of that year he was employed by the Atlantic Refining Co. at its Franklin, Pa., refinery. He remained with the company for 11 years going to the Baltimore branch of Standard Oil Co. (New Jersey) in 1913 and two years later to International Petroleum Co., Ltd., at Toronto, Canada. With this company he spent considerable time in South America. In 1917 he was transferred to Imperial Oil, Ltd., at Sarnia, Ontario, and shortly became secretary and treasurer of the company. He went to the parent New Jersey Standard in 1928 as assistant comptroller and in June, 1933, was appointed comptroller. Since that time he has visited all the European offices to install new accounting systems.

### Reuben P. Resor

Reuben P. Resor, newly elected treasurer of the company, has been employed by various Standard companies over a period of 46 years. His first employment was with the Consolidated Tank Line Co. in Cincinnati after spending two years in high school in that city. Four years later he went to Chicago as a clerk with Standard Oil Co. (Indiana) and in 1905 was transferred to Standard Oil Co. of New York as a member of the auditing staff. With the dissolution in 1911 he was transferred to the New Jersey Standard and soon was appointed assistant treasurer. He is widely known in banking and investment circles.

Mr. Swain has been connected with the New Jersey Standard for approximately 30 years. He was engaged in private practice of law at Buffalo when he joined the company's legal department. He was appointed general counsel in 1915. Mr. Wellman has been connected with the company's legal staff for a number of years. He was appointed associate general counsel several years ago.

## Oscar Sutro Succumbs While Visiting Capital

WASHINGTON, D. C., June 10.—Oscar Sutro, vice president and general counsel of the Standard Oil Co. of California, expired suddenly while visiting here. Death was due to heart trouble.

OSCAR SUTRO

He was a member of the law firm of Pillsbury, Madison and Sutro and had been counsel for the company for many years. In 1926 he was elected a director and in May, 1930, elected a vice president of the Standard of California. He was 61 years of age.

### TEXAS OPEN FLOW TEST

AUSTIN, Tex., June 10.—The Texas Railroad Commission has appointed 11 petroleum engineers and two chemical engineers to take open flow capacities of 1,500 gas wells, to be completed by July 10. The men include Thomas F. O'Rourke, Harry W. Elliott, Jr., Aubrey C. Godbold, Jack Woodward, Heath Renfro, M. L. Ferguson, Gilmer Huston, Mack Upchurch, Dr. F. V. L. Patten, H. T. White, A. B. Stevens, S. T. Martin and J. P. McGowan, all recent graduates of University of Texas and A. & M. College.

# Mid-Continent Refiners Increase Runs to Supply Better Market Demands

By W. T. ZIEGENHAIN

Mid-Continent refiners will run approximately 20,000 bbls. more crude daily through their plants in June than May. This increase might be considered only a reasonable boost in face of low stocks and the approaching season of larger consumption. The move should not be interpreted as reflecting disregard for planned operations and that the market for finished products is headed downward, even though gasoline allocations are generally disregarded.

Over the past four years refiners have been forced to conserve cash and the equipment has not been kept in best repair. There has been an actual loss of capacity even though it does not show up in surveys. Plants generally could not run the quantity of crude claimed several years ago and without certain physical improvements in a number of plants, the production of gasoline could not be greatly increased.

With East Texas operations remaining at a low figure and with every indication pointing to continued state control of crude production and refinery operations, the 5 to 8 per cent increase in domestic oil consumption is ample justification for refiners in other sections of the Mid-Continent to take up some of the line lost in former years.

June schedules call for daily runs of 485,015 bbls. in the Mid-Continent compared with 466,015 bbls. a month previous. One year ago crude schedules of these same companies totaled 459,908 bbls. Every division of the Mid-Continent refining area reports increased runs in June except Southwest Texas where the total is slightly under that for the previous month.

### East Texas

East Texas refiners have been holding their runs to a relatively low figure, for months but in June report an increase over May of 8,425 bbls. per day. About 50 per cent of the plants are operating and a large number of the idle units are expected to never resume operations. If this proves correct, it means the flush production and boom days for East Texas are over and operations will settle down to a routine that will eventually mean fewer but larger refining units for the field.

There continues to be many name changes through purchase and ownership transfers of one kind or another. More than 20 such changes occurred among the 84 plants in the past two months. One of the most important of these was the purchase of the Arrow Refining & Producing Co. by the Gilliland Refining Co. The old Arrow plant at Overton is being reconditioned and a cracking unit is being installed. H. B. May, formerly president of the Arrow, has joined the Gilliland interests and will continue to manage the Arrow plant.

### North Central Texas

Refiners in the North Central portion of Texas report the next largest increase in runs for June. Total runs will average 44,050 bbls. daily this month compared with 39,715 bbls. per day in May. The Continental Oil Co. has resumed operations in its plant at Fort Worth after a 10-day shutdown for cleaning and inspection. The Panhandle Refining Co. is reconditioning its plant at Leuders, using equipment from its old King Mills plant where possible. The capacity of the Leuders plant will be increased to 1,200 bbls. daily as the result of the work. The Texas Pacific Coal & Oil Co. has resumed operations in its Fort Worth refinery, the skimming and cracking equipment having been started up about June 1 and the lubricating oil units will be started within one week.

### Oklahoma and Kansas

In June, Oklahoma refineries will operate practically as they did in May. The only change in the list of operating and idle units is the resumption of complete plant operations in the Bristow plant of the Wilcox Oil & Gas Co. The purchase of 250,000 bbls. of stored crude at Sapulpa from the Continental Oil Co. augments the crude gathering around Bristow so that the refinery may be operated at about 2,500 bbls. daily.

Kansas refiners continue to operate at a well sustained rate, the June schedules totaling 118,250 bbls. daily. Only one plant in Kansas is idle and Kansas offers a contrast with East Texas. In Kansas 21 plants are processing 118,000 bbls. of crude daily while in East Texas 86 plants are processing 62,000 bbls. daily.

## Mid-Continent Refinery Crude Runs

**Average Daily Crude Runs (Barrels)**

(Advance estimate compiled by The Oil and Gas Journal)

| | 1931 | 1932 | 1933 | 1934 | 1935 |
|---|---|---|---|---|---|
| January | 478,795 | 405,910 | 399,405 | 448,360 | 426,070 |
| February | 470,125 | 411,280 | 407,125 | 456,619 | 448,810 |
| March | 449,634 | 401,155 | 423,445 | 465,680 | 451,510 |
| April | 497,391 | 419,391 | 441,000 | 458,220 | 467,765 |
| May | 510,540 | 436,160 | 470,460 | 457,165 | 466,015 |
| June | 567,915 | 440,765 | 479,987 | 459,908 | 485,015 |
| July | 588,840 | 433,255 | 525,845 | 477,012 | ..... |
| August | 590,545 | 427,710 | 518,510 | 501,750 | ..... |
| September | 588,105 | 430,430 | 526,749 | 499,830 | ..... |
| October | 472,190 | 401,995 | 495,756 | 500,755 | ..... |
| November | 480,440 | 408,180 | 481,335 | 500,445 | ..... |
| December | 456,525 | 416,275 | 434,275 | 440,735 | ..... |

**Operations by Refinery Districts**

| | June dly. crude cpy. | June dly. crude runs | May dly. crude runs | June increases over May (bbls. dly.) |
|---|---|---|---|---|
| Arkansas | 38,550 | 20,750 | 20,400 | 350 |
| East Texas | 238,300 | 62,115 | 53,690 | 8,425 |
| Kansas | 179,450 | 118,250 | 117,610 | 640 |
| North Central Texas | 108,680 | 44,050 | 39,715 | 4,335 |
| North Louisiana | 55,450 | 22,750 | 22,150 | 600 |
| Oklahoma | 296,200 | 144,600 | 141,010 | 3,590 |
| Southwest Texas | 26,300 | 15,400 | 15,890 | *490 |
| West Texas and Panhandle | 125,820 | 57,100 | 55,550 | 1,550 |
| Total | 1,042,450 | 485,015 | 466,015 | 19,000 |

*Increase.

### OKLAHOMA

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Anderson-Prichard Oil Corp., Cyril | 6,000 | 4,500 | 5,000 |
| Altitude Petroleum Corp. (J. H. Peacock Refining Co.) Oklahoma City | 3,000 | (*) | (*) |
| Associated Petroleum Corp., Allen | 8,000 | (*) | (*) |
| Barnsdall Oil Co., Barnsdall | 6,000 | 3,500 | 3,500 |
| Barnsdall Oil Co., Okmulgee | 10,000 | 5,000 | 5,500 |
| Bell Oil & Gas Co., Grandfield | 4,500 | 2,700 | 2,700 |
| Black Gold Refining Co., Oklahoma City | 2,500 | 1,200 | 1,500 |
| Century Petroleum Corp., Oklahoma City | 2,500 | (*) | (*) |
| Champlin Refining Co., Enid | 16,000 | 6,500 | 6,000 |
| Continental Oil Co., Ponca City | 30,000 | 15,000 | 15,000 |
| Crescent Refining Co., Holdenville | 1,000 | (*) | (*) |
| Cushing Refining & Gasoline Co., Blackwell | 1,700 | 1,500 | 1,600 |
| Cushing Refining & Gasoline Co., Cushing | 6,700 | 4,100 | 4,100 |
| Deep Rock Oil Corp., Cushing | 10,000 | 9,000 | 9,000 |
| Enoch Oil Co., Enid | 5,000 | 2,500 | 2,500 |
| Empire Oil & Refining Co., Okmulgee | 4,000 | 2,300 | 2,300 |
| Empire Oil & Refining Co., Ponca City | 12,000 | 8,900 | 8,800 |
| Globe Oil & Refining Co., Blackwell | 7,500 | (*) | (*) |
| Government Refining Co., No. 1, Oklahoma City | 1,000 | (*) | (*) |
| Government Refining Co., No. 2, Oklahoma City | 3,500 | (*) | (*) |
| Government Refining Co., No. 3, Seminole | 800 | (*) | (*) |
| Hanger Refining Co., Oklahoma City | 1,000 | (*) | (*) |
| Johnson Oil Refining Co., Cleveland | 6,000 | 4,000 | 4,500 |
| Major Petroleum Products Co., Oklahoma City | 2,000 | 400 | 450 |
| Marathon Oil Co., Bristow | 5,000 | 2,500 | 2,250 |
| Mid-Continent Petroleum Corp., West Tulsa | 40,000 | 19,000 | 18,000 |
| Monarch Refining Co., Oklahoma City | 1,000 | 300 | 300 |
| Omar Refining Co., Garber | 3,000 | 2,500 | 2,500 |
| Paramount Refining Co., Oklahoma City | 2,000 | 700 | 800 |
| Peppers Gasoline Co., Oklahoma City | 500 | 200 | 150 |
| Phillips Petroleum Co., Okmulgee | 6,000 | 4,700 | 4,200 |
| Pure Oil Co., Muskogee | 9,000 | 8,000 | 7,600 |
| Rock Island Refining Co., Beckett | 6,000 | 3,000 | 2,200 |
| Sinclair Refining Co., Sand Springs | 8,000 | 3,000 | 2,900 |
| Sinclair Refining Co., West Tulsa | 6,000 | (*) | (*) |
| Sun Oil Co., Yale | 5,000 | 2,400 | 2,000 |
| Sunray Oil Co., Allen | 7,000 | 2,800 | 2,100 |
| Texas Co., West Tulsa | 15,000 | 12,000 | 12,000 |
| Tide Water Oil Co., Drumright | 15,000 | 9,500 | 8,500 |
| Triangle Producing & Refining Co., Oklahoma City | 1,000 | 400 | 450 |
| Wilcox Oil & Gas Co., Bristow | 5,000 | 2,500 | 1,600 |
| Wirt Franklin Petroleum Corp., Ardmore | 4,000 | (*) | (*) |
| Yale Oil Corp., Yale | 2,000 | (*) | (*) |
| Total | 296,200 | 144,600 | 141,000 |

*Shut down.

### NORTH CENTRAL TEXAS

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Allstate Refining Co., Thrall | 2,300 | 1,000 | 1,200 |
| Atlantic, Pacific & Gulf Refining Co., Wichita Falls | 5,000 | (*) | (*) |
| Baird Refining Co., Baird | 1,400 | 1,300 | 1,300 |
| Canyon Oil & Gas Co., Inc., The, Cisco | 500 | (*) | (*) |
| Continental Oil Co., Wichita Falls | 6,000 | 3,200 | 3,300 |
| Co-operative Consumers Refinery, Inc., Megargel | 1,000 | 200 | 200 |
| Empire Oil & Refining Co., Gainesville | 5,000 | (*) | (*) |
| Exchange Petroleum Corp., Albany | 500 | 300 | 250 |
| Falls Refining Co., Wichita Falls | 2,000 | 300 | 300 |
| Gratex Refining & Fuel Co., Graham | 500 | 200 | 170 |
| Gulf Refining Co., Fort Worth | 10,000 | 3,700 | 3,610 |
| Gulf Refining Co., Sweetwater | 5,000 | 4,000 | 3,870 |
| Haskell Oil Refining Co., Breckenridge | 200 | (*) | (*) |
| Hightower Oil & Refining Corp., Brownwood | 750 | 400 | 400 |
| Hill Refining Co., Ballinger | 50 | 50 | 50 |
| Jacksboro Refining Co., Jacksboro | 50 | 50 | 50 |
| LaSalle Petroleum Co., Burkburnett | 2,500 | 700 | 600 |
| Magnolia Petroleum Co., Fort Worth, No. 1 | 12,000 | 5,800 | 5,500 |
| Magnolia Petroleum Co., Fort Worth, No. 2 | 6,000 | (*) | (*) |
| Marathon Oil Co., Fort Worth | 5,000 | 3,700 | 3,500 |
| Moutray Refining Co., Hawley | 600 | 300 | 240 |
| Meunster Refining Co., Meunster | 300 | 150 | 150 |
| New Deal Refining Co., Abilene | 300 | (*) | (*) |
| Nolting Refining Co., Sweetwater | 1,000 | (*) | (*) |
| Norgold Refining Co., West Olney | 450 | 200 | 200 |
| Olney Oil & Refining Co., North Olney | 3,000 | 1,850 | 1,800 |
| Omega Refining Co., Brownwood | 200 | (*) | (*) |
| Phoenix Refining Co., Hawley | 800 | 500 | 500 |
| Panhandle Refining Co., Wichita Falls | 5,000 | 2,500 | 2,600 |
| Panhandle Refining Co., Leuders | 1,200 | 700 | 275 |
| Pentex Refining Co., Echo | 400 | (*) | (*) |
| Pilot Point Refining Co., Pilot Point | 500 | 100 | 100 |
| Sinclair Refining Co., Fort Worth | 5,000 | 2,500 | 2,500 |
| Southtex Refining Co., Trent | 250 | (*) | (*) |
| Southland Refining Co., Olney | 1,000 | (*) | (*) |
| Starlight Refining Co., Inc., Ballinger | 500 | 300 | 300 |
| Star Refining & Producing Co., Fort Worth | 1,200 | (*) | (*) |
| Superior Refining Co., Tiffin | 300 | (*) | (*) |
| Taylor Refining Co., Taylor | 6,000 | 1,000 | 1,000 |
| Taxman Refining Co., Wichita Falls | 3,500 | 2,500 | 2,200 |
| Texas Pacific Coal & Oil Co., Fort Worth | 3,000 | 2,000 | (*) |
| Texas Pacific Coal & Oil Co., Caddo | 1,000 | 700 | 700 |
| Tucker Refining Co., Wichita Falls | 200 | 150 | 150 |
| Waggoner Refining Co., Electra | 6,000 | 2,500 | 2,500 |
| Watt Refining Co., Brownwood | 200 | 200 | 200 |
| Total | 108,650 | 44,050 | 39,715 |

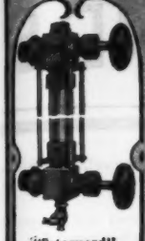
*Shut down.

(Continued on Page 30)

Hydraulic Ejector

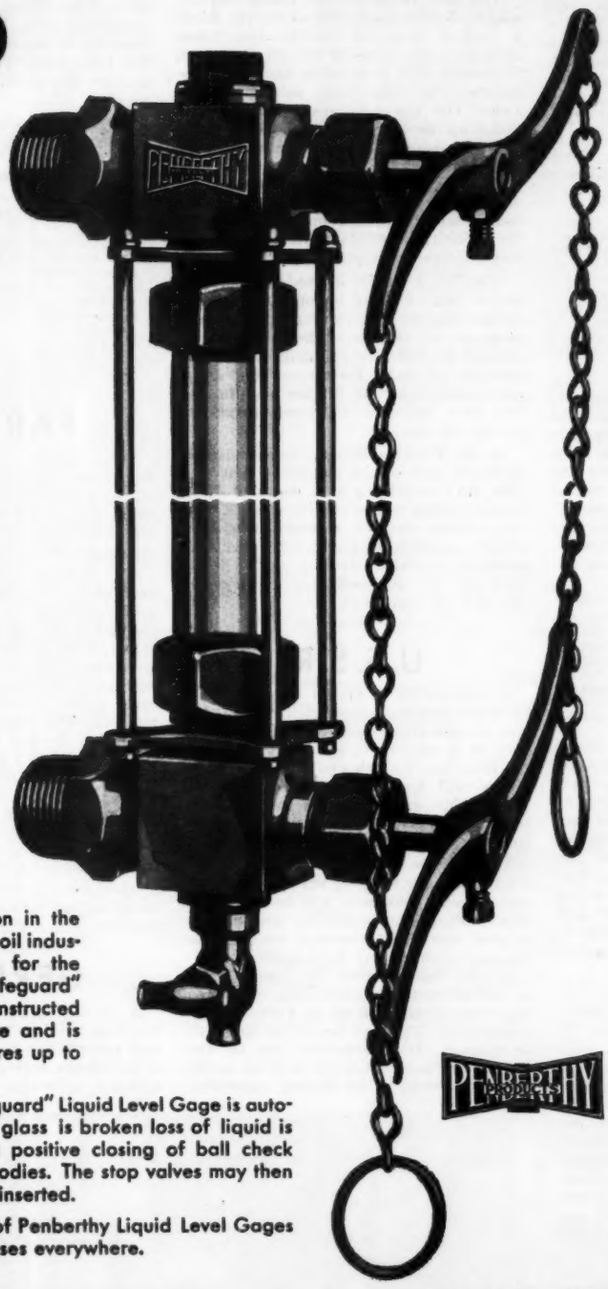
PENBERTHY PRODUCTS

Steam Ejector

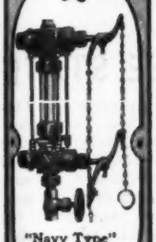

"Safeguard" Automatic Liquid Level Gage

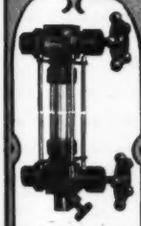
# "SAFEGUARD"

# LIQUID LEVEL GAGE



ALL THAT THE NAME IMPLIES


"Navy Type" Liquid Level Gage


"All-Iron" Automatic Liquid Level Gage

Automatic Cellar Drainer (Water or Steam Operated)

**SAFETY** is a primary consideration in the selection of equipment for the oil industry—that is an important reason for the popularity of the Penberthy "Safeguard" Liquid Level Gage. It is ruggedly constructed of high grade steam metal bronze and is recommended for working pressures up to 300 pounds.

Operation of the Penberthy "Safeguard" Liquid Level Gage is automatic and dependable. When the glass is broken loss of liquid is prevented by the immediate and positive closing of ball check valves in both upper and lower bodies. The stop valves may then be safely closed and a new glass inserted.

"Safeguard" and the other types of Penberthy Liquid Level Gages are carried in stock by supply houses everywhere.

PENBERTHY PRODUCTS

## PENBERTHY INJECTOR COMPANY

*Manufacturers of Quality Products since 1886*

DETROIT, MICHIGAN WINDSOR, ONTARIO

Automatic Injector

Gas Engine Lubricator

Snap Lever Oiler

Automatic Electric Sump Pump

Spring Compression Grease Cup

Plain Compression Grease Cup

Screw Plunger Grease Cup

# NEWS FROM FOREIGN LANDS

## GREAT BRITAIN

Consumption of gasoline and fuel oil increased in the United Kingdom the first quarter of this year over the same period with decreases in most of the other products. The increase more than offset the decreases so that there was an increase this year in the total consumption of petroleum products according to the Government's reports. The following table gives the consumption of refinery products in the United Kingdom for the first quarter of 1935 and 1934: (data in imperial gallons):

| | 1935 | 1934 |
|---|---|---|
| Gasoline | 271,499,869 | 257,961,813 |
| Fuel oil | 79,639,617 | 75,814,803 |
| Kerosene | 60,043,517 | 62,747,751 |
| Lubricating oil | 25,913,331 | 28,825,976 |
| Gas oil | 20,411,206 | 23,240,738 |
| Naphtha | 6,439,246 | 6,125,812 |
| Misc. oils | 2,418,703 | 1,148,374 |
| Total | 466,275,488 | 455,864,367 |

This increase in consumption of petroleum products is reflected in the figures on imports which cover four months operations instead of three as in the case of domestic consumption. These data show a decline in crude oil imports for the four months compared to the same period in 1934 with declines in some of the refinery products. Imports of gasoline and fuel oil however showed a large increase. The following table summarizes this situation (data in imperial gallons):

| | 1935 | 1934 |
|---|---|---|
| Crude oil | 149,752,000 | 158,467,000 |
| Gasoline | 419,284,000 | 349,726,000 |
| Kerosene | 73,147,000 | 84,930,000 |
| Lubricating oil | 33,371,000 | 34,559,000 |
| Gas oil | 40,162,000 | 47,010,000 |
| Fuel oil | 198,698,000 | 189,448,000 |
| Total | 921,413,000 | 872,811,000 |

In the crude oil imports, Iraq which was not a factor a year ago leads all other countries in furnishing the crude supply of refineries in United Kingdom with a total of 41,469,000 imperial gallons for the first four months. Mexico is second with 38,625,000 imperial gallons. The crude oil imports from Iraq made reductions necessary in Persia which decreased from 85,293,000 imperial gallons the first four months of 1935 to 31,227,000 gallons for the same period this year.

The Shell and Standard of New Jersey refineries in the Dutch West Indies continue to be the main importers of gasoline into the United Kingdom with a total of 177,761,000 imperial gallons for the first four months which compares with 152,489,000 imperial gallons for the same period in 1934. Gasoline imports from Persia also greatly increased. Imports from the United States decreased.

In the case of kerosene, imports from United States for the two periods under comparisons dropped from 28,228,000 imperial gallons in 1934 to 5,060,000 imperial gallons for the same period this year. Imports from Persia increased from 25,479,000 gallons to 31,984,000 gallons. The United States leads in imports of lubricating oils with a total of 20,588,000 gallons for the first four months which represented a slight increase over 1934. A substantial part of the fuel oil imports came from Netherlands West Indies with a total of almost 100,000,000 gallons for the first four months.

## COLOMBIA

The Oro No. 2 of the Colombian Petroleum Co. (Gulf) located in the northern part of Barco concession of Colombia is drilling at a depth of 650 feet according to a recent report from the field. Developments at this test are being watched with considerable interest as it is the first well to be drilled in this section of the concession by the Colombian company.

The test is located in jungle country about 3.5 kilometers west of Puerto Barco a port of entry on the Rio Catatumbo through which supplies are obtained from Venezuela. The location is about 12 kilometers from the tests drilled by the Colon Oil Corp. several years ago in Colon on the Venezuelan side. These tests obtained some oil but have never been developed commercially. In the same general area of the Barco concession the No. 1 Oro was drilled in 1919 at the same time the concession was owned by the Doherty interests. This test did not secure commercial production.

The No. 2 Oro is located on the crest of the fold of what is commonly known as the Rio de Oro structure. There are seepages of oil near the location. In drilling to 650 feet the drill has passed through oil sand formations but it is understood that no further significance has been attached to developments so far at the test.

In the Petrolea Section, located in the southern half of the concession one test (No. 6A) is drilling at a depth of 1,300 feet according to recent field reports. This test adjoins the No. 6 which was completed a small producer at 1,040 feet. The company will start drilling its No. 3 the first test of the South Dome as soon as No. 6A is completed.

## U. S. S. R.

A commission of the oil administration of the U.S.S.R. has officially selected a site on the River Ufa for the construction of a refinery to operate with crude oil from the Ishembaevo Field. The refinery will have an initial capacity of 10,000 bbls. daily and this later will be increased to 20,000 bbls. daily. Construction work on the plant has started.

Due to the nature of the crude oil with which the refinery will operate, special refinery equipment will be necessary. The crude is low in gravity and high in sulphur content. A thorough study of the treating problem has been made.

Recent reports from the U.S.S.R. are to the effect that construction of a pipe line from Makhach-Kala to Voronezh has commenced. The first leg of the line will be Grozny. It is expected that by the end of the year Baku oil will be available for refining at the Grozny refineries.

## PERSIA

Crude oil production in Persia for April totaled 584,000 tons or 136,266 bbls. daily. This was a decrease when compared with March and also April, 1934, when the production averaged 142,807 bbls. daily. The following table summarizes the production figures (data in tons):

| | 1935 | 1934 |
|---|---|---|
| April | 584,000 | 612,033 |
| First four months | 2,498,000 | 2,417,294 |

Production of Shell units in Venezuela according to latest available information was as follows (data in barrels):

| | |
|---|---|
| Caribbean Petroleum Co., four weeks ending May 18: | |
| Mene Grande | 1,094,000 |
| Venezuela Oil Concessions, Ltd.: | |
| La Rosa | 619,600 |
| Lagunillas | 1,939,700 |
| Concepcion | 111,100 |
| La Paz | 14,000 |
| Colon Oil Corp. (May 10): | |
| Colon | 395,900 |

## FAR EAST

That American trucks equipped with Diesel engines and employing soya bean oil for fuel could be successfully marketed in the Far East is a novel idea recently advanced to American Trade Commissioner Julian B. Foster, Singapore.

The sponsor of the plan is the representative of a German Diesel engine company located in the Orient. He claims, according to the trade commissioner, that he has interested the Chinese government in his engine, and has demonstrated to Chinese officials that it could be run on either soya bean or coconut oil. The Chinese were particularly interested in the soya bean trials, because of the fact that they were not always assured of the supply of Diesel oil, while they could always depend on getting soya bean oil.

At present quotations Diesel fuel is slightly lower in price than soya bean oil. However, if there is a glut on the market for the latter it could be used to advantage as a motor fuel, the report states.

## GERMANY

A further appropriation of 4,000,000 Reichsmarks has been made by the German government for use in the promotion of petroleum boring activities by private agencies, according to a report from the American Consulate General, Frankfort-on-Main, made public by the Commerce Department.

Last year, it is pointed out, a special fund of 5,000,000 Reichsmarks was set aside by the government for this purpose which was used up in a short time in loans to concerns engaged in test borings. According to published reports, from 50 to 60 new borings have been carried out with the aid of loans from the fund in question.

It is expected, the report states, that the number of borings resulting from this year's appropriation will be as large as last year since only 40 per cent of the cost will be covered by the government in 1935, compared with 50 per cent in 1934.

## IRISH FREE STATE

The small skimming plant of the Cork Harbour Oil Wharves, Ltd., at Haulbowline Island, Irish Free State which has been under construction for several months is about completed and will start operating in the near future. The plant will have a crude oil capacity of 600 bbls. daily. The products of the plant will be exempt from certain taxes paid on imported refined products. The crude for the refinery is to be supplied by the Lobitos Oilfields, Ltd.

## MEXICO

Following are the values and production taxes for May as furnished by the Mexican Government; (calculated in silver at exchange of 3.60.

**VALUES**

Fuel oil:
27.17 silver pesos per c. m.=$1.20 per bbl.
Gasoline:
67.81 silver pesos per c. m.=$.0713 per gal.
Kerosene:
49.64 silver pesos per c. m.=$.0522 per gal.

**PRODUCTION TAXES**

| | Per cu. m. (pesos) | In U.S. currency per bbl. |
|---|---|---|
| Crude: | | |
| (Sp. gr. 0.93=Be. 20.38).. | 2.140 | $0.13644 |
| (Sp. gr. 0.96=Be. 15.68) or heavier | 1.907 | .08433 |
| Fuel oil: | | |
| (Sp. gr. 0.95=Be. 17.21)... | 2.934 | .12957 |
| Gasoline: | | (per gal.) |
| Crude | 2.712 | .00285 |
| Refined | 1.356 | .00143 |
| Kerosene: | | |
| Crude | 2.978 | .00313 |
| Refined | 1.489 | .00157 |

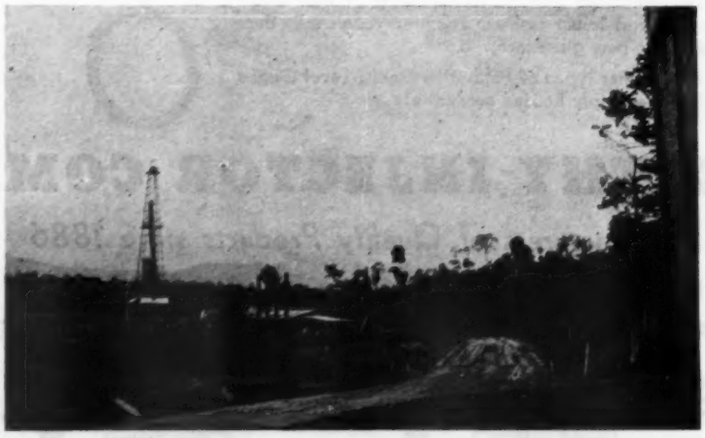
The production tax on fuel oil will vary approximately .01062 per barrel for each degree of specific gravity above (deduct) or below (add) 0.95 specific gravity.

The production tax on light crude will vary approximately .01137 per barrel for each degree of specific gravity above (deduct) or below (add) 0.93 specific gravity.

**Export Taxes**

Note: As export taxes are payable in silver at par, to make calculations in United States currency, take figures given below, multiply them by 2 and divide by rate of exchange at time of payment.

| | U. S. currency ($1 for 2 pesos) (Per bbl.) |
|---|---|
| Crude: | |
| (Sp. gr. 0.93=Be. 20.38)..... | $0.07949 |
| (Sp. gr. 0.96=Be. 15.68) or heavier ..... | .04928 |
| Fuel oil: | |
| (Sp. gr. 0.95=Be. 17.21)..... | .05063 |
| Gasoline: | (Per gal.) |
| Crude ..... | .00472 |
| Refined ..... | .00189 |
| Kerosene: | |
| Crude ..... | .00151 |
| Refined ..... | .00057 |



*Wildcat in interior of Sumatra drilled by Nederlandsche Koloniale Petroleum Maatschappij (N. K. P. M.)*

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## All That Is Needed

The oil industry stands out conspicuously as actually stimulated by relief from the threat of Federal control. Freed by the Supreme Court decision from the uncertainty as to their future status which discouraged planning and enterprise oil men feel they are again in charge of their own business and at liberty to go ahead. And the whole industry feels the impetus.

Annulment of the code mattered little because it had contributed little to the industry. Its benefits, if they can be credited to the code, were by-products rather than direct results: the hopeful posting of dollar crude and the freedom to get together in conference on industry problems without fear of antitrust prosecution.

The improvement which the industry has been able to gain in the past two years has been due to these two impulses, both within the industry, and in no particular to any direct effect from the code or from the Federal petroleum administration.

In fact the petroleum administrator admits this when he still insists that his only way to bring the industry to heel may be to declare it a public utility.

In sharp contrast to that theory the industry presents actual recovery notably increasing when the Federal handicap was removed. It is no longer, like the blind man's dog, exploring uncertainly to the end of its chain until checked by the groping stick, but free to leap forward.

The broad principles of the Supreme Court decision appear to have disposed effectively of the Thomas oil control bill. The House would be foolish to waste time upon it especially since Chairman Cole of the sub-committee which conducted an exhaustive investigation into oil industry problems, is flatly opposed to it as unnecessary and unwise.

His view is also that of the board of directors of the American Petroleum Institute and of informed oil men generally, that all Congress should do is to approve the interstate compact, authorize the Bureau of Mines to continue to act as a fact finding body on estimates of consumption and production and provide for continuance of the Connally Act and regulation of imports.

On the suggestion of Governor Landon of Kansas, Governor Marland of Oklahoma has called a second conference of the oil producing states to advance interstate regulation.

The question of quotas raised by President Roosevelt is answered by experience. No oil producing state is ever likely to be more "state minded" on its share of production than Texas has been yet the allowables set by the Railroad Commission have been even less than the allocations put out by the Federal petroleum administration.

Although the Federal allocations were merely recommendations without legal force the manner in which they have been respected by the various states indicates that there should be no difficulty in maintaining a similar allocation among the states themselves.

Oil producers individually and oil producing states have had enough bitter experience to learn thoroughly the folly of overproduction. It has been that lesson and not any power of the petroleum administration that has kept production within bounds and maintained the market. And it will be the effective force behind the interstate compact.

## The Pioneer Code

The second resolution adopted by the board of directors of the American Petroleum Institute at their New York meeting suggesting revival of the marketing code of ethics approved by the Federal Trade Commission in 1931 recalls the fact that the oil industry was the pioneer in urging fair trade practices.

The "Code of Ethics in Marketing Petroleum Products" was framed long before the New Deal was thought of. It was a code of fair competition, voluntarily signed, designed to eradicate certain abuses and unfair practices that had crept into the oil business as into all businesses.

Some 16,000 signatures were obtained but the results were not in proportion. With the introduction of the oil code the other lapsed. Hopeful expectations of results from the new code were not realized and it was soon recognized that the marketing problem had so many diverse angles and divergent ramifications that no speedy solution was possible.

It was at this stage that C. E. Arnott as chairman of the Marketing Sub-Committee of the Planning and Coordination Commitee was given charge of the situation. There has been no propaganda handed out at Washington regarding his work which has been within the industry rather than through the petroleum administration, but the results are beginning to show in market improvement.

Chairman Arnott and his sub-committee have been able to convince the marketing division of the wisdom of stabilization and the need for co-operation. The outcome is that with the ending of the oil code opportunity is presented for the revival of the original code of ethics under more favorable conditions than when first presented.

Furthermore, the experience of Chairman Arnott and his subcommittee has developed points for revision and amendment of the code of 1931 that will make it more workable and more efficient.

The Federal Trade Commission is to be asked to approve these revisions as it did the original code of ethics and when that is done the marketing division of the oil industry will be one business that will have a real code of fair practice evolved from the experience of the industry and based on self-government.

## Situation in California

Reopening of gasoline wars in California following the annulment of the oil code was an excuse rather than a cause. The code had not put an end to price wars but its elimination offered a pretext for another rampage which California can be expected to deal with as usual.

The meeting of 800 producers pledging continued curtailment of crude production was much more significant. The constructive element has the determining influence. As Chairman Lloyd of the Central Committee told the meeting: "There is no need of hysteria regarding conditions in the oil industry. The demand is steady and the decline constant and there are no big new fields to flood the market."

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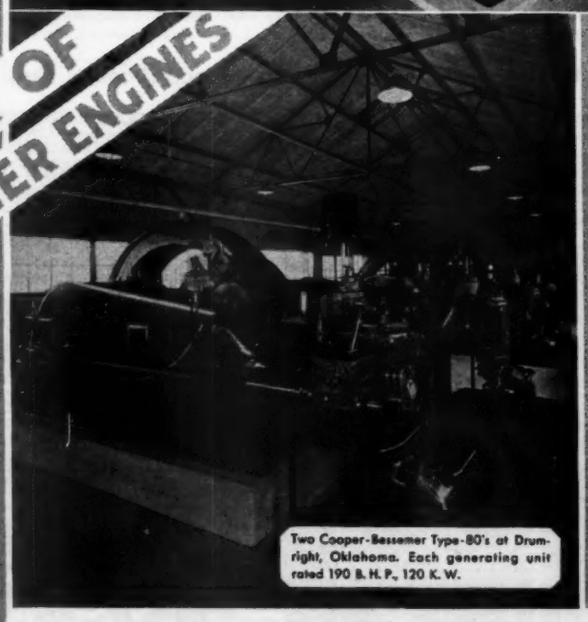

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# Confidence in Group 3 Gasoline Market Rising With Predictions of Heavy July Business

By T. F. SMILEY

Rising confidence in the Oklahoma (Group 3) gasoline market was visible this week, with predictions that July would witness heavy movement in this division of the refined oil trade. Doleful forebodings generated in turn by dust storms, shivering weather, sudden decease of the codes, floods and then uncertainty concerning the federal tax were giving way before realization that in the face of an admittedly disheartening train of adverse conditions the motor fuel market had been gaining ground and that prospects had been brightening steadily. Developments from day to day were revealing that much of the apprehension was baseless.

Fear had been expressed in recent weeks that torrential rains and impassable roads, along with other factors militating against use of the family car, would result in such a backing up of motor fuel stocks that inter-refinery buying (declared by some to have been the salvation of the market this year) would break down.

### Don't Want to Swim Home

"Folks aren't going to start out on vacation tours till the danger of having to swim back home is over," was the way one observer put it. "We are approaching a point where the majors, which have been absorbing the surplus stocks of independent refiners, will be unable to continue the role of big brother."

It was prophesied too that as soon as gasoline prices had reached a profitable level small refiners here and there would begin to shade their quotations and jump their runs, inviting a return of the demoralization which reigned last year. The fact that some East Texas material found its way to northern points during May seemed to lend substance to such misgivings, for it was known that carefully thought-out plans comprehended keeping these shipments directed to the Gulf or to southern consuming areas. It looked as though the buying power of the majors which were expected to absorb all legally produced East Texas gasoline had been drawn upon too heavily. And perhaps it had.

In any event, analysis of the situation as it has resolved itself, discloses little ground for concern on this score. At the opening of March, 1935, the prevailing price to the trade for low octane gasoline in East Texas was 3½ cents f.o.b. refinery. By June 1 the price had risen to 4¾ cents. Notwithstanding this sharp upturn, which forecasters had said would set wrecking crews at work, the increase in shipments from independent refineries in East Texas was only five cars (less than 1,000 bbls.) daily. This is scarcely a seasonal rise.

### East Texas Situation Improved

In the meantime the East Texas situation has improved. Accumulations of illegitimately produced crude are by way of being cleaned up, and persons in close touch with conditions in that area assert there actually is likely to be a scramble for crude within a few weeks.

Encouraging reports are received from throughout the rest of the Mid-Continent territory concerning the status of inter-refinery buying. Following the invalidation of the codes uneasiness was apparent among independent refiners, especially those who, instead of disposing of their gasoline as it was produced, had been building up inventories in the expectation of getting better than the ruling prices. Some of these became panicky and hurriedly offered their material in the open market. Upon discovering that there was no intention to abandon inter-refinery buying they recovered from their momentary fright.

Little of the nervousness resulting from removal of the codes was discernible this week. Hope was expressed that some type of refinery allocation board would be set up and that allocations for July would be fixed as in preceding months. General willingness to abide by such allocations was evident. The extent to which conditions had returned to their former shape was seen in the fact that some of the large companies were obliged to hunt around for gasoline to fill their needs.

Jobber interest was reported to be slightly better, though actual buying was limited. Few jobbers believed the federal tax would be discontinued after June 30, but until all uncertainty was removed they did not care to have large stocks of taxed gasoline on their hands. Middle-octane material was stronger than last week.

### Natural Gasoline Firm

Virtually no change was observable in the natural gasoline market. There was enough buying to keep prices at the level which has prevailed for several weeks and the market was firm. Most of the movement was to the Gulf on contract. Sentiment through the trade was cheerful, particularly when current conditions were compared with those prevailing a year ago.

Kerosene drooped still further, losing another eighth. This material has had a good season and refiners are not complaining. Along with kerosene, the high-

(Continued on Page 32)

## Refined Oil Market Barometer

Save in California, where destructive price-cutting has broken out again, the motor fuel market seems headed for still better levels. Apprehension stirred by the removal of the codes has all but died out and profitable business awaits the arrival of favorable motoring weather in various areas. Opinion is virtually unanimous that the federal tax on gasoline and lubricating oils will be retained, but the trade will not be at its best till all uncertainty has been removed. Kerosene and the heating oils are taking their seasonal dip.

**Mid-Continent.**—Gasoline holding with further rise looked for. Kerosene and high-gravity distillates sagging. Lubricants steady.

**East Coast.**—Summer demand for gasoline under way. Bright and steam-refined stocks steady.

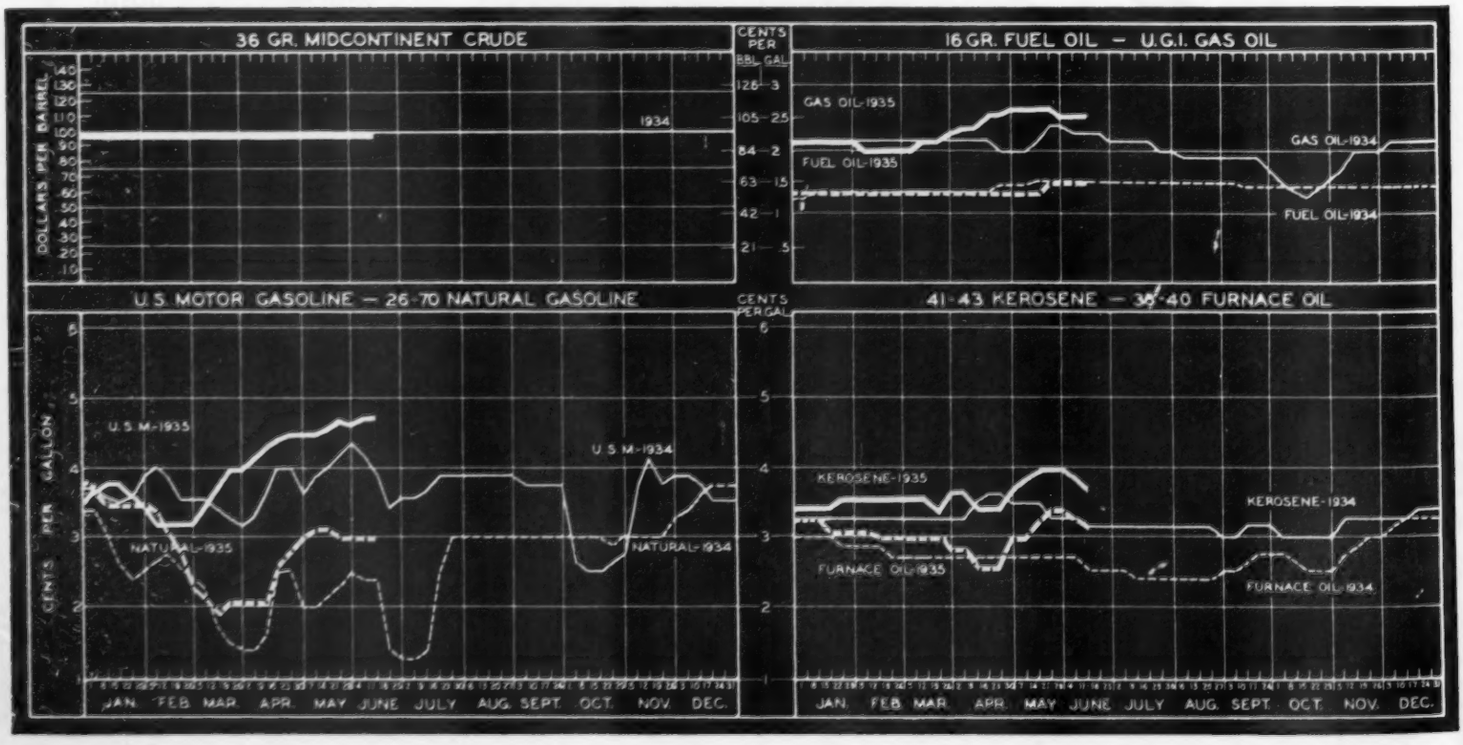
**Gulf Coast.**—Gasoline firm, with prices strong. Kerosene not so active, but supply limited. Fuels steady. Lubricant prices firm, but inactive.

**Pennsylvania.**—Gasoline strong and up slightly. Residuals steady. Market generally firm.

**California.**—Market unsettled by price war, with gasoline weak.

**Chicago.**—Gasoline strong. Kerosene and heating oils easier.

## Representative Mid-Continent Quotations on Crude Oil and Refined Products Basis Oklahoma (Group 3)



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# Refinery Shipments Indicate Summer Demand for Gasoline on East Coast Is Now Under Way

By C. O. WILLSON
New York Bureau, The Oil and Gas Journal

NEW YORK, June 11.—Gasoline shipments from refineries indicate that the long awaited summer demand is under way. Domestic shipments to jobbers and retail distributors have been increasing since the latter part of May and have been especially heavy over the past week. This is accounted for largely as a seasonal development, June being third or fourth among the months in actual gasoline consumption by car owners.

This movement was in great part on long time contracts. Spot trading here and at the Gulf Coast was not especially active. The spot prices quoted in New York harbor were 5¾ cents for low octane, 6 cents for middle octane, 6¼ cents for 65 octane and above and 6½ cents for ethylized regular grade material. At the Gulf the quotation on 65 octane material was 5½ cents, with more material reported to be available at that figure than was the case a week ago.

The strength shown in the Gulf and Atlantic Seaboard markets over the past 60 days has been largely due to cargo buying by large refiners. Under normal conditions gasoline regularly accumulates at the Gulf and is offered on the spot market by small refiners and terminal operators who buy their supplies from inland Texas. It has often happened that when this material was not readily absorbed by buyers it accumulated to the point where it was dumped on the eastern or export markets at low prices. Various stabilization efforts have been made to remedy this situation by providing outlets for the sellers. Under the latest stabilization program, in which most refiners participated, its sponsors have been able to obtain a balance in supply and demand so that several cargoes were purchased at the Gulf at prices in line with the prevailing spot quotations and prices there have been advancing.

What part if any of this stabilization program can be carried on with the ending of the N.R.A. has not been definitely decided. Those in a position to know contend that a steady buying program at the Gulf is necessary to maintain stable prices, although the seasonal increase in demand over the next three or four months may result in a situation in which this type of purchase can be reduced to a minimum. Much will depend, it is said, on the trend in refinery runs and this in turn is directly dependent on the curtailment of crude oil production in the several producing states.

### Government Report

The April report of the Bureau of Mines gives authoritative data on the gasoline situation in this territory six weeks ago. The following table summarizes this information with comparative data for March, 1935, and April, 1934 (data in thousands of barrels):

EAST COAST REFINERY OPERATIONS

| | Output, Apr., 1935 | April, 1934 | March, 1935 |
|---|---|---|---|
| Crude runs to stills | 13,555 | 14,192 | 13,746 |
| Gasoline | 5,577 | 6,107 | 5,797 |
| Kerosene | 743 | 857 | 976 |
| Gas oil and distillate | 1,244 | 1,330 | 1,549 |
| Residual fuel oils | 3,468 | 3,816 | 3,665 |
| Lubricants | 638 | 643 | 596 |
| Wax (lbs.) | 18,760 | 19,320 | 17,360 |
| Coke (tons) | 12.6 | 10.4 | 14 |
| Asphalt (tons) | 105.5 | 93.6 | 65 |
| **Stocks End of Month** | | | |
| Gasoline | 19,355 | 16,820 | 19,402 |
| Kerosene | 1,852 | 1,031 | 1,689 |
| Gas oil and distillate | 2,223 | 2,029 | 3,176 |
| Residual fuel oils | 5,719 | 4,919 | 6,121 |
| Lubricants | 2,261 | 2,132 | 2,435 |
| Wax (lbs.) | 55,709 | 36,279 | 54,180 |
| Coke (tons) | 10.4 | 9.9 | 11 |
| Asphalt (tons) | 121.3 | 128.3 | 118 |

This table shows that crude runs to stills averaged 451,833 bbls. in April, 443,400 bbls. in March and 473,066 bbls. daily in April, 1934. The variations in crude runs to stills indicate the differences in output of refinery products with the exception of kerosene, gas oil and distillate. In the face of a declining market eastern refiners in April reduced their output of these products substantially with a smaller reduction in fuel oil.

Despite the reduction in output, kerosene stocks increased materially in April with a small increase in gas oil and distillate. Fuel oil stocks were reduced. This fact when considered with previous monthly reports covering the entire country shows that the statistical position of these heavy oils is improving.

Stocks of kerosene and gas oil and distillate are substantially higher than they were a year ago when the market for these products was strong. Refiners of lubricating oils reduced their stocks 175,000 bbls. in April and the inventories at the end of the month were practically the same as the year previous. There was a small reduction in wax stocks in April.

The April data indicate that refinery operations, so far as the crude runs to stills and gasoline production were concerned, are about the same as a year ago. Some of the less important products are not as strong as they were in this territory last spring.

### Other Products

Those in direct touch with the furnace oil and kerosene market are more optimistic than they were a few weeks ago when the 1934-35 season was being brought to an end with lower prices. Furnace oil contracts are now being made with jobbers and consumers and the volume of these transactions points to an increase in consumption during the coming season. It is said that there are many new distributors making preparations to sell oil to consumers next season. This reflects the trend for sellers of oil burners to enter the furnace oil business and vice versa. In making a burner sale it is an advantage to the salesman to be able to offer the prospect of a contract covering his oil requirements for the first year.

It is claimed by some that this situation works to the detriment of the furnace oil business so far as getting fair prices for its products is concerned. Cases are cited in which the burner salesman to close a deal makes concessions in oil rather than burner prices. On the other hand it has been charged by independent dealers that oil companies sell burners at cost or less in order to secure additional outlets for oil

This excessive competition, as pointed out by one oil company executive, regardless of who is to blame, at least has the merit of increasing sales of burners which may at some future date bring higher prices for oil. Sales of all types of oil burners are said to be running ahead of last year. Tank car prices quoted in New York harbor range from 5 cents for No. 1, 4 cents for Nos. 2 and 3 and 3¾ to 4 cents for No. 4. Kerosene and range oil distillate is generally quoted at 5 cents with the spot demand light.

Gas oils and Diesel oils range from 4 to 4¼ cents. The market on U.G.I. gas oil is firm although this is the season of low demand. Supplies are said to be limited both here and also at the Gulf Coast. The motor boat season has also brought an enlarged demand for Diesel fuels. Many of the larger boats are now equipped with Diesel engines rather than gasoline engines. A few companies have a substantial retail business in Diesel oils along the waterways during the summer months. Available data indicate that this demand will be larger this season than last. It is anticipated that another year will see more standardization in regard to Diesel fuels for this and other classes of consumers.

The predicted advance in bunker fuels both to the marine and industrial trade has not materialized. The prevailing price to the marine trade on Bunker C is $1.15. Spot and contract sales are being made on that basis with some contracts calling for a top of $1.30. It is said that to meet an enlarged demand recently some heavy fuel has been imported. This means the payment of a 21-cent per barrel import tax.

The higher prices on steam refined stocks and bright stocks (Pennsylvania) both in the domestic and export markets are being maintained. The demand is fair to strong as reported by several manufacturers and brokers. The export business in all lubricating oils has been disappointing over the past month. Export wax prices are unchanged.

### Export Prices

Export gasoline prices were steady. It was reported that the Russians purchased one cargo of low gravity material for blending. The price was not reported. Quotations at the Gulf for 64-66, 375 endpoint material range from 5⅝ to 5½ cents.

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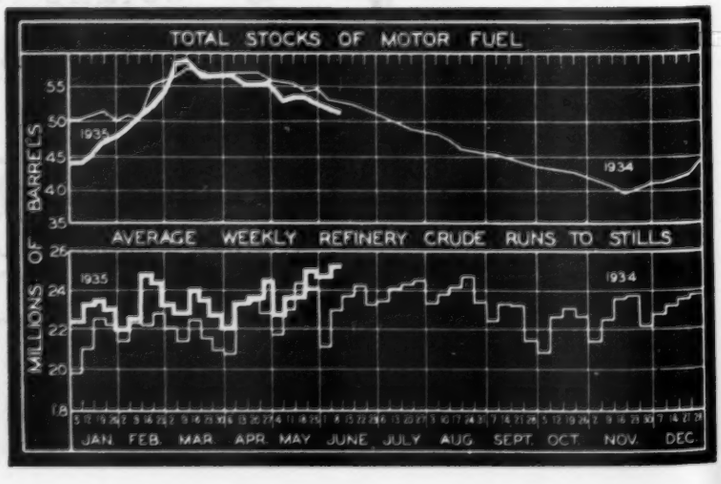
### SKIFF REFINERY PROJECT

CALGARY, Alberta, June 8.—O. G. Devenish, president of Devenish Petroleums, Ltd., with head office at Calgary, has announced that a small refinery unit will be erected at Skiff, Alberta, to handle the crude production of the Devenish Petroleum wells. The plant will produce tractor oil, securing approximately 60 per cent recovery from the heavy crude, and will be in operation by July 1.

## American Petroleum Institute Weekly Refinery Statistics

Week Ending June 8, 1935

| | Capacity reporting per cent | Daily crude runs (bbls.) | Finished motor fuel (bbls.) | Gas oil and fuel oil (bbls.) |
|---|---|---|---|---|
| East Coast | 100.0 | 445,000 | 17,037,000 | 10,057,000 |
| Appalachian | 94.8 | 90,000 | 2,169,000 | 702,000 |
| Indiana, Illinois, Kentucky | 95.9 | 353,000 | 9,292,000 | 4,267,000 |
| Oklahoma, Kansas, Missouri | 84.8 | 238,000 | 4,902,000 | 4,145,000 |
| Inland Texas | 48.5 | 85,000 | 1,171,000 | 1,915,000 |
| Texas Gulf | 96.4 | 511,000 | 5,474,000 | 9,635,000 |
| Louisiana Gulf | 96.4 | 116,000 | 1,333,000 | 3,508,000 |
| North Louisiana and Arkansas | 90.0 | 51,000 | 261,000 | 308,000 |
| Rocky Mountain | 61.9 | 38,000 | 967,000 | 778,000 |
| California | 92.6 | 432,000 | 9,560,000 | 64,027,000 |
| Total United States | 89.5 | 2,350,000 | 52,226,000 | 99,342,000 |



# REFINERY AND CRUDE PRICES

Quotations on refined products are for interstate or export movement except as otherwise noted

The following quotations are exclusive of the federal excise taxes of 1 cent a gallon on gasoline and 4 cents on lubricating oils.

## Refinery Gasoline

| | June 11 | | June 4 | |
|---|---|---|---|---|
| **OKLAHOMA (Group 3)—** | | | | |
| U. S. Motor grades: | | | | |
| Below 63 octane | .04¾ | .04⅞ | .04¾ | .04⅞ |
| 63-70 octane | .05⅝ | .05¼ | .05½ | .05⅝ |
| 60-62 400 grade: | | | | |
| Below 63 octane | .04¾ | .04⅞ | .04¾ | .04⅞ |
| 63-70 octane | .05⅝ | .05¾ | .05½ | .05⅝ |
| 64-66 375 | .04⅞ | .05 | .04⅞ | .05 |
| 68-70 360 | .05 | .05⅛ | .05 | .05⅛ |
| **NORTH TEXAS—** | | | | |
| U. S. Motor grades: | | | | |
| Below 63 octane | .04¾ | .04⅞ | .04¾ | .04⅞ |
| 63-70 octane | .05⅝ | .05¾ | .05½ | .05⅝ |
| 60-62 400 | .04¾ | .04⅞ | .04¾ | .04⅞ |
| 64-66 375 | .04⅞ | .05 | .04⅞ | .05 |
| **NORTH LOUISIANA (Ark., N. La. & Miss. del.)—** | | | | |
| U. S. Motor grades: | | | | |
| Below 63 octane | .05¼ | | .05¼ | |
| 63-70 octane | .06 | | .06 | |
| 60-62 400 | .05¼ | | .05¼ | |
| **ARKANSAS (Ark., N. La. & Miss. del.)—** | | | | |
| U. S. Motor grades: | | | | |
| Below 63 octane | .05¼ | | .05¼ | |
| 63-70 octane | .06 | | .06 | |
| **CHICAGO (based on Oklahoma Group 3)—** | | | | |
| U. S. Motor grades: | | | | |
| Below 63 octane | .04¾ | .04⅞ | .04¾ | .04⅞ |
| 63-70 octane | .05⅝ | .05¾ | .05½ | .05⅝ |
| 60-62 400 | .04⅞ | .05 | .04¾ | .04⅞ |
| 64-66 375 | .04⅞ | .05⅛ | .04⅞ | .05 |
| 68-70 360 | .05 | .05⅛ | .05 | .05⅛ |
| Aviation fighting grade | .05¾ | .05⅞ | .05⅝ | .05¾ |
| **PENNSYLVANIA (inland refineries)—** | | | | |
| 58-60 U. S. Motor: | | | | |
| Below 60 octane | .06 | | .05¾ | |
| 60-64.9 | .07 | | .06¾ | .07 |
| 65-70 octane | .07¼ | | .07⅛ | .07¼ |
| 64-66 375 | .06¾ | | | |
| 68-70 350 | .06⅞ | | .06½ | .06¾ |
| **CALIFORNIA (domestic movement)—** | | | | |
| 54-58 U. S. Motor | .06 | .06½ | .06 | .07 |
| 58-60 400 | .06¼ | .06¾ | .06½ | .07¼ |
| **EAST COAST—** | | | | |
| U. S. Motor, below 60 octane: | | | | |
| *New York (Bayonne) | .05¾ | | .05¾ | |
| Baltimore | .05¾ | | .05¾ | |
| U. S. Motor, 60-64.9 octane: | | | | |
| *New York (Bayonne) | .06 | | .06 | |
| Philadelphia | .06 | .06¼ | .06¼ | |
| Boston | .06 | | .06 | |
| Baltimore | .06 | .06¼ | .06 | .06¼ |
| Charleston, S. C. | .06 | | .06 | |
| U. S. Motor, 65 and above: | | | | |
| *New York (Bayonne) | .06¼ | | .06¼ | |
| Philadelphia | .06¼ | .06½ | .06½ | |
| Boston | .06¼ | | .06¼ | |
| Baltimore | .06¼ | | .06¼ | |
| Charleston, S. C. | .06¼ | | .06¼ | |

*All grades of gasoline one-fourth cent less for small barge shipments.

| | | | | |
|---|---|---|---|---|
| **GULF COAST (domestic)—** | | | | |
| U. S. Motor: | | | | |
| Below 60 octane | .05 | .05¼ | .05 | .05¼ |
| 60-64.9 octane | .05¼ | .05½ | .05¼ | .05½ |
| 65 octane and higher | .05½ | | .05½ | |

## Naphtha

| | June 11 | | June 4 | |
|---|---|---|---|---|
| **PENNSYLVANIA (inland refineries)—** | | | | |
| 50-52 450 (blending) | .05⅞ | | .05⅝ | .05½ |
| 52-54 450 (blending) | .05⅞ | | .05⅝ | .05½ |
| 54-56 450 (blending) | .06 | | .05⅝ | .05½ |
| **CHICAGO (based on Oklahoma Group 3)—** | | | | |
| 50-52 450 (blending) | .04¾ | .05 | .04¾ | .05 |
| Cleaners' naphtha, 56-58 gr., 200 i.b.p., 320 e.p. | .06⅞ | .07 | .06⅞ | .07 |
| Lacquer diluent, 180 i.b.p., 250 e.p. | .07⅞ | .08 | .07⅞ | .08 |
| Lacquer diluent, 140 i.b.p., 200 e.p. | .08⅞ | .09 | .08⅞ | .09 |
| Rubber solvent, 68-70 gr., 100 i.b.p., 300 e.p. | .06⅞ | .07 | .06⅞ | .07 |
| Stoddard solvent, 300 i.b.p., 410 e.p., over 83° flash | .06⅜ | .06½ | .06⅜ | .06½ |
| Pet. thinner, 290-300 i.b.p., 410 e.p., over 83° flash | .06⅜ | .06½ | .06⅜ | .06½ |
| V.M.&P. naphtha, 56-58 gr., 190-200 i.b.p., 330 e.p. | .06⅞ | .07 | .06⅞ | .07 |
| Petroleum spirits | .05⅞ | .06 | .05⅞ | .06 |

## Natural Gasoline

| | June 11 | | June 4 | |
|---|---|---|---|---|
| **OKLAHOMA (Group 3)—** | | | | |
| Grade 26-70 | .03 | .03⅛ | .03 | .03⅛ |
| Grade 18-55 | .03¾ | .04 | .03¾ | .04 |
| Low vapor pressure grades: | | | | |
| 14 lb. v.p. (max.) | .04¼ | .04½ | .04¼ | .04½ |
| 12 lb. v.p. (max.) | .04⅝ | .04¾ | .04⅝ | .04¾ |
| **NORTH TEXAS—** | | | | |
| Grade 26-70 | .03 | | .03 | |
| Grade 18-55 | .03¾ | .03⅞ | .03¾ | .03⅞ |
| Low vapor pressure grades: | | | | |
| *14 lb. v.p. (max.) | .04¼ | .04⅜ | .04¼ | .04⅜ |
| *12 lb. v.p. (max.) | .04⅝ | | .04⅝ | |

*Nominal.

| | | | | |
|---|---|---|---|---|
| **NORTH LOUISIANA (Ark., N. La. & Miss. del.)—** | | | | |
| Grade 26-70 | .03¼ | | .03¼ | |
| **CALIFORNIA—** | | | | |
| 75-85 375 | .05 | .06 | .05 | .06 |

## Kerosene

(All kerosenes water white)

| | June 11 | | June 4 | |
|---|---|---|---|---|
| **OKLAHOMA (Group 3)—** | | | | |
| 41-43 | .03¾ | .04 | .03⅞ | .04 |
| 42-44 | .03⅞ | .04⅛ | .04 | .04⅛ |
| **NORTH TEXAS—** | | | | |
| 41-43 | .03¾ | .04 | .03⅞ | .04 |
| **NORTH LOUISIANA (Ark., N. La. & Miss. del.)—** | | | | |
| 41-43 | .04⅛ | | .04⅛ | |
| **ARKANSAS (Ark., N. La. & Miss. del.)—** | | | | |
| 41-43 | .04¼ | | .04¼ | |
| **PENNSYLVANIA (inland refineries)—** | | | | |
| 45 | .04¾ | | .04¾ | |
| 46 | .04⅞ | | .04⅞ | |
| 47 | .05 | | .05½ | |
| **CHICAGO (based on Oklahoma Group 3)—** | | | | |
| 41-43 | .03⅞ | .04 | .04 | .04⅛ |
| 42-44 | .04⅛ | .04¼ | .04⅛ | .04¼ |
| **CALIFORNIA (Pacific Coast consumption)—** | | | | |
| 38-40 high burning test | .04½ | .05 | .04½ | .05 |
| **NEW YORK (Bayonne, N. J.)—** | | | | |
| 41-43 | .05 | | .05 | |
| **GULF COAST (domestic)—** | | | | |
| 41-43 | .04¼ | .04½ | .04¼ | .04½ |

## Petroleum Coke

(Prices per ton f.o.b. refineries in Chicago area)
(Refineries will absorb freight to 80 cents a ton)

| | June 11 | June 4 |
|---|---|---|
| Pile run | 6.00 | 5.75 |
| Direct from still | 7.00 | 6.75 |
| Egg, nut, pea | 8.00 | 8.00 |
| Lump | 8.00 | 8.00 |

## Furnace Oil

| | June 11 | | June 4 | |
|---|---|---|---|---|
| **OKLAHOMA (Group 3)—** | | | | |
| No. 1 prime white, 38-42 | .03¼ | .03½ | .03⅜ | .03½ |
| No. 1 straw, 38-40 | .03⅛ | .03⅜ | .03¼ | .03⅜ |
| No. 2 straw, 32-36 | .02⅞ | .03⅛ | .02⅞ | .03⅛ |
| No. 2 dark, 32-36 | .02⅝ | .02⅞ | .02⅝ | .02⅞ |
| No. 3, 28-32 | .02½ | .02¾ | .02½ | .02¾ |
| No. 3, 15 and above, 28-32 | .02⅜ | .02½ | .02⅜ | .02½ |
| **NORTH TEXAS—** | | | | |
| No. 1 prime white, 38-42 | .03¼ | .03½ | .03⅜ | .03½ |
| No. 1 straw, 38-40 | .03⅛ | .03⅜ | .03¼ | .03⅜ |
| **NORTH LOUISIANA (Ark., N. La. & Miss. del.)—** | | | | |
| No. 2, 32-36 | .03⅛ | .03¼ | .03⅛ | .03¼ |
| **ARKANSAS (Ark., N. La. & Miss. del.)—** | | | | |
| No. 2, 32-36 | .03½ | | .03½ | |
| No. 3, 28-32 | .03¼ | | .03¼ | |
| **CHICAGO (based on Oklahoma Group 3)—** | | | | |
| No. 1 prime white, 38-40 | .03⅜ | .03½ | .03½ | .03¾ |
| No. 1 straw, 38-40 | .03¼ | .03⅜ | .03⅜ | .03½ |
| No. 2 straw, 32-36 | .03 | .03⅛ | .03¼ | .03¼ |
| No. 2 dark, 32-36 | .02⅞ | .03 | .02⅞ | .03 |
| No. 3 zero to 15, 28-32 | .02½ | .02⅝ | | |
| No. 3, 15 and above, 28-32 | .02⅛ | .02¼ | | |
| **NEW YORK (Bayonne, N. J.)—** | | | | |
| No. 1 | .05 | | .05 | |
| No. 2 | .04 | | .04 | |
| No. 4 | .04 | | .03¾ | .04 |

## Gas Oil and Fuel Oil

(Gas oil per gal., fuel oil per bbl.)

| | June 11 | | June 4 | |
|---|---|---|---|---|
| **OKLAHOMA (Group 3)—** | | | | |
| U.G.I. gas oil | .02½ | .02⅝ | .02½ | .02⅝ |
| No. 4, 24-28 | .87½ | .90 | .87½ | .90 |
| No. 4, 15 and above, 24-28 | .75 | .80 | .75 | .80 |
| No. 5 | .70 | .75 | .70 | .75 |
| No. 6 | .67½ | .70 | .67½ | .70 |
| Below 18 fuel oil, industrial | .65 | .67½ | .65 | .67½ |
| **NORTH TEXAS—** | | | | |
| U.G.I. gas oil | .02½ | .02⅝ | .02½ | .02⅝ |
| No. 4, 24-28 | .87½ | .90 | .87½ | .90 |
| No. 5 | .72½ | .75 | .72½ | .75 |
| No. 6 | .67½ | .70 | .67½ | .70 |
| Below 18 fuel oil, industrial | .65 | .67½ | .65 | .67½ |
| **NORTH LOUISIANA (Ark., N. La. & Miss. del.)—** | | | | |
| U.G.I. gas oil | .02⅝ | .03 | .02⅞ | .03 |
| 10-14 fuel oil, industrial | .75 | .80 | .75 | .80 |
| **ARKANSAS (Ark., N. La. & Miss. del.)—** | | | | |
| 10-14 fuel oil, industrial | .60 | .65 | .60 | .65 |
| **CHICAGO (based on Oklahoma Group 3)—** | | | | |
| U.G.I. gas oil | .02⅜ | .02⅝ | .02½ | .02⅝ |
| No. 4, 24-28 | .87½ | .90 | .87½ | .90 |
| No. 4, 15 and above 24-28 | .72½ | .77½ | .72½ | .77½ |
| No. 5, 18-22 | .67½ | .70 | .67½ | .70 |
| No. 6, 10-16 | .57½ | .60 | .57½ | .60 |

Note: Fuel oils of more than 40 cold test generally 5 to 15 cents per barrel in all these areas.

| | | | | |
|---|---|---|---|---|
| **PENNSYLVANIA (inland refineries)—** | | | | |
| 36-40 | .04⅛ | .04¼ | .04⅛ | .04¼ |
| **CALIFORNIA—** | | | | |
| Los Angeles: | | | | |
| 30-34 gas oil, per bbl. | 1.05 | 1.25 | 1.05 | 1.25 |
| 27 plus Diesel | 1.05 | 1.25 | 1.05 | 1.25 |
| 27 plus Diesel (bunkers) | 1.25 | 1.30 | 1.25 | 1.30 |
| 12-16 (bunkers at tidewater) | .89 | .95 | .89 | .95 |
| 10-16 (cargo lots) | .75 | .90 | .75 | .90 |
| 12-17 (tank cars) | .60 | .95 | .60 | .95 |
| San Joaquin Valley: | | | | |
| 10-18 (tank cars) | .60 | .75 | .60 | .75 |
| San Francisco: | | | | |
| 27 plus Diesel, per bbl. | 1.25 | | 1.25 | |
| 27 plus Diesel (bunkers) | 1.35 | | 1.35 | |
| 10-16 (bunkers) | 1.00 | | 1.00 | |
| **GULF COAST—** | | | | |
| 28-30 gas oil | .03½ | .03⅝ | .03½ | .03⅝ |
| 28-30 Diesel (bunkers) | 1.70 | | 1.70 | |
| Bunker C (bulk cargoes) | .85 | .90 | .85 | .90 |
| Bunker C (bunkers) | .95 | 1.00 | .95 | 1.00 |
| **NEW YORK (Bayonne, N. J.)—** | | | | |
| 27 plus, gas oil | .04 | .04¼ | .04 | .04¼ |
| 28-30 Diesel (lighterage 6½ cents per bbl.) | 1.89 | | 1.89 | |
| 28-30 Diesel (tank cars) | .04 | .04¼ | .04¼ | |
| *Bunker C (to ocean-going ships in N. Y. harbor) | 1.15 | | 1.15 | |
| Industrial fuel (tank cars) | .04 | | .03¾ | .04 |

*Lighterage charge 5 cents per barrel additional.

## Neutral Oil

(Vis. at 100° F. except Pennsylvania, and color N.P.A.)

| | June 11 | | June 4 | |
|---|---|---|---|---|
| **OKLAHOMA (Group 3)—** | | | | |
| Zero to 10 Cold Test: | | | | |
| 150-3 | .10 | | .10 | |
| 180-3 | .11¼ | | .11¼ | |
| 180-4 | .10¾ | | .10¾ | |
| 200-3 | .11¾ | | .11¾ | |
| 200-4 | .11¼ | | .11¼ | |
| 240-3 | .13¾ | | .13¾ | |
| 240-4 | .13¼ | | .13¼ | |
| 280-3 | .14¾ | | .14¾ | |
| 280-4 | .14 | | .14 | |
| 300-3½ | .15¼ | | .15¼ | |
| 400-4 | .17¼ | | .17¼ | |
| 100-2 paraffin oil | .05¾ | | .05¾ | |
| 15-20 Cold Test: | | | | |
| 200-3 | .10¾ | | .10¾ | |
| 200-4 | .10¼ | | .10¼ | |
| 240-3 | .12¾ | | .12¾ | |
| 240-4 | .12¼ | | .12¼ | |
| 280-3 | .13¾ | | .13¾ | |
| 280-4 | .13 | | .13 | |
| **GULF COAST—** | | | | |
| Pale Oils: | | | | |
| 200-3 | .07 | .07½ | .07 | .07½ |
| 300-3 | .07½ | .08 | .07½ | .08 |
| 500-3½ | .08½ | .09 | .08½ | .09 |
| 750-3½ | .09 | .09¼ | .09 | .09¼ |
| 1,200-3½ | .09½ | .09¾ | .09½ | .09¾ |
| 2,000-4 | .09¾ | .10 | .09¾ | .10 |
| Red Oil: | | | | |
| 200-5-6 | .07 | .07¼ | .07 | .07¼ |
| 300-5-6 | .07¼ | .07½ | .07¼ | .07½ |
| 500-5-6 | .08 | .08½ | .08 | .08½ |
| 750 | .08½ | .09 | .08½ | .09 |
| 1,200-5-6 | .09¼ | .09½ | .09¼ | .09½ |
| **CALIFORNIA (moving to domestic market)—** | | | | |
| Pale Oils: | | | | |
| 100-2½-3 | .07½ | .07¾ | .07½ | .07¾ |
| 200-2½-3 | .08 | .08¾ | .08 | .08¾ |
| 300-3-3½ | .09 | .10 | .09 | .10 |
| 350-3-4 | .10½ | .11 | .10½ | .11 |
| 400-3-4 | .12 | .12¼ | .12 | .12¼ |
| 450-3-4 | .12½ | .12¾ | .12½ | .12¾ |
| 550-3-4 | .13 | .13½ | .13 | .13½ |
| 600-3-4 | .13½ | .14 | .13½ | .14 |
| Red Oils: | | | | |
| 200-4-5 | .08½ | .09 | .08½ | .09 |
| 300-5-6 | .09 | | .09 | |
| 350-5-6 | .10 | .10¼ | .10 | .10¼ |

| | | | | |
|---|---|---|---|---|
| 400-5-6 | .10½ | .10¾ | .10½ | .10¾ |
| 450-5-6 | .11 | .11¼ | .11 | .11¼ |
| 500-5-6 | .11½ | .11¾ | .11½ | .11¾ |
| 600-5-6½ | .12 | .12¾ | .12 | .12¾ |
| 700-6½ plus | .13 | .13¼ | .13 | .13¼ |
| 750-6½ plus | .13½ | .13¾ | .13½ | .13¾ |
| 900-6½ plus | .14 | .14½ | .14 | .14½ |
| PENNSYLVANIA— | | | | |
| 150 vis. at 70° F., 3 color, 400-405 flash: | | | | |
| Zero pour test | .20½ | .21 | .20½ | .21 |
| 10 pour test | .19½ | .20 | .19½ | .20 |
| 15 pour test | .19 | .19½ | .19 | .19½ |
| 25 pour test | .18 | .18½ | .18 | .18½ |
| 180 vis. at 70° F., 3 color: | | | | |
| 20 pour test | .21 | .21½ | .21 | .21½ |
| 200 vis. at 70° F., 3 color: | | | | |
| Zero pour test | .25½ | .26 | .25½ | .26 |
| 10 pour test | .24½ | .25 | .24½ | .25 |
| 15 pour test | .24 | .24½ | .24 | .24½ |
| 25 pour test | .23 | .23½ | .23 | .23½ |

## Bright and Steam Refined Stocks

| OKLAHOMA (Group 3)— | June 11 | | June 4 | |
|---|---|---|---|---|
| Bright Stocks: | | | | |
| 190-200 D | .17½ | | .17½ | |
| 150-160 D, 0-10 | .14½ | | .14½ | |
| 150-160 D, 10-25 | .14 | | .14 | |
| 150-160 25-40 | .13½ | | .13½ | |
| 150-160 E | .13½ | | .13½ | |
| Steam refined: | | | | |
| 630 green (treated) | .09½ | | .09½ | |
| 600 light green (untreated) | .08½ | | .08½ | |
| 600 dark green (untreated) | .05 | .06 | .05 | .06 |
| PENNSYLVANIA— | | | | |
| Bright Stocks (Pennsylvania grade, No. 8 color, 145-50 at 510; 540-550 flash): | | | | |
| 10 pour test | .20 | .20½ | .20 | .20½ |
| 15 pour test | .19 | .19½ | .19 | .19½ |
| 20 pour test | .18 | .18½ | .18 | .18½ |
| 25 pour test | .17 | .17½ | .17 | .17½ |
| Steam refined: | | | | |
| 600 | .09½ | .10 | .09½ | .10 |
| 650 | .11 | .11½ | .11 | .11½ |
| 600 Pennsylvania flash | .12 | .12½ | .12 | .12½ |
| 630 flash | .17 | .17½ | .17 | .17½ |
| 600 Warren E filtered | .13 | .13½ | .13 | .13½ |

## Wax and Petrolatum

(Prices per pound)

| OKLAHOMA (Group 3)— | June 11 | | June 4 | |
|---|---|---|---|---|
| 124-126 white crude scale | .02 | .02¼ | .02 | .02¼ |
| PENNSYLVANIA (inland refineries)— | | | | |
| 122-124 | .0210 | .0215 | .0210 | .0215 |
| 124-126 | .0215 | .0220 | .0215 | .0220 |
| NEW YORK— | | | | |
| Wax (a.m.p.) in bags fully refined: | | | | |
| Refined grades: | | | | |
| 123-125 | .0420 | | .0380 | |
| 125-127 | .0430 | | .0400 | |
| 128-130 | .0455 | | .0425 | |
| 130-132 | .0470 | | .0440 | |
| 133-135 | .0530 | | .0500 | |
| 135-137 | .0555 | | .0525 | |
| Crude scale: | | | | |
| 124-126 w.s. | .0205 | .0220 | .0200 | .0225 |
| 124-126 y.s. | .0205 | .0215 | .02 | .0215 |
| Petroleum in barrels in carload lots: | | | | |
| Dark green | .01⅞ | | .01⅞ | |
| Amber | .02⅞ | .03 | .02⅞ | .03 |
| Extra amber | .03 | .03⅛ | .03 | .03⅛ |
| Lily white | .06⅝ | .06¾ | .06⅝ | .06¾ |
| Snow white | .07¾ | .07⅞ | .07¾ | .07⅞ |
| Cream | .05⅝ | .05¾ | .05⅝ | .05¾ |
| CHICAGO (f.o.b. switching district)*— | | | | |
| 122-124 wax | .0440 | .0450 | .0440 | .0450 |
| 125-127 wax | .0465 | .0475 | .0465 | .0475 |
| 127-129 wax | .0480 | .0490 | .0480 | .0490 |
| 130-132 wax | .0540 | .0550 | .0540 | .0550 |
| 132-134 wax | .0565 | .0575 | .0565 | .0575 |

*Cents per pound on carload lots in burlap bags of 225 lbs. approx. Add 3° a.m.p.

## Export Prices

GASOLINE

| GULF COAST— | June 11 | | June 4 | |
|---|---|---|---|---|
| U. S. Motor | .05¼ | .05¼ | .05¼ | |
| 60-62 400 | .05¼ | | .05¼ | .05⅜ |
| 61-63 390 | .05¼ | .05⅜ | .05⅜ | |
| 64-66 375 | .05⅜ | .05½ | .05½ | |
| LOS ANGELES: | | | | |
| U. S. Motor grades: | | | | |
| 53-55 octane | .04 | | .04 | |
| 55-65 octane | .04 | .04¼ | .04 | .04¼ |
| 65-67 octane | .04¼ | .04½ | .04¼ | .04½ |
| 67-69 octane | .04½ | .04¾ | .04½ | .04¾ |
| Above 69 octane | .04¾ | .05 | .04¾ | .05 |
| 58-60 400 endpoint | .04½ | .05 | .04½ | .05 |
| KEROSENE | | | | |
| GULF COAST— | | | | |
| 41-43 prime white | .03⅞ | .04 | .03⅞ | .04 |
| 41-43 water white | .04 | .04¼ | .04 | .04¼ |
| 44 water white | .04¼ | | .04¼ | |
| LOS ANGELES: | | | | |
| 41-43 water white | .04½ | .05 | .04½ | .05 |
| LUBRICANTS | | | | |
| NEW YORK (f.a.s. in bbls.)— | | | | |
| Cylinder Stocks: | | | | |
| 600 Warren E | .20 | | .20 | |
| 600 S.R. unfiltered | .16½ | .17 | .16½ | .17 |
| 650 S.R. unfiltered | .18 | | .18 | |
| 600 flash S.R. | .19 | .19½ | .19 | .19½ |
| 630 flash S.R. | .24 | .24½ | .24 | .24½ |
| Bright Stocks: | | | | |
| 8 color | .23½ | | .23½ | |
| 6½ plus colors in dilution | .22½ | | .22½ | |
| NEUTRAL OIL | | | | |
| 200-3 color | .28 | .30 | .28 | .30 |
| 150-3 color | .23 | .25 | .23 | .25 |
| PARAFFIN WAX | | | | |
| NEW YORK (prices per pound): | | | | |
| 123-125 a.m.p. | .03625 | | .03625 | |
| 125-127 a.m.p. | .0375 | | .0375 | |
| 128-130 a.m.p. | .0400 | | .0400 | |
| 130-132 a.m.p. | .0425 | .0450 | .0425 | .0450 |
| 133-135 a.m.p. | .0475 | | .0475 | |
| 135-137 a.m.p. | .05 | | .05 | |
| Crude scale: | | | | |
| 124-126 w.s. | .0205 | .0215 | .0210 | .0220 |
| 124-126 y.s. | .0205 | .0210 | .0205 | .0210 |

# Crude Oil Gravity Table

| Gravity— | 1 Oklahoma and Kansas | 2 North Texas, Central Texas and East Central Texas | 3 North Louisiana and Arkansas | 4 Gray County, Texas | 5 Carson, Hutchinson and Moore Counties, Texas | 6 Conroe, Texas | 7 Salt Creek, Wyo. | 8 Gulf Coast, Texas and Louisiana | 9 Gulf Coast Texas and Louisiana | 10 Cotton Valley, Louisiana |
|---|---|---|---|---|---|---|---|---|---|---|
| Below 20 | .... | .... | .... | .... | .... | .... | .... | $ .82 | $ .82 | .... |
| 20-20.9 | .... | .... | .... | .... | .... | .... | .... | .84 | .84 | .... |
| 21-21.9 | .... | .... | .... | .... | .... | .... | .... | .86 | .86 | .... |
| 22-22.9 | .... | .... | .... | .... | .... | .... | .... | .88 | .88 | .... |
| 23-23.9 | .... | .... | .... | .... | .... | .... | .... | .90 | .90 | .... |
| 24-24.9 | .... | .... | .... | .... | .... | .... | .... | .92 | .92 | .... |
| Below 25 | *$ .76 | .... | .... | .... | .... | .... | .... | .... | .... | $ .70 |
| 25-25.9 | * .78 | .... | .... | .... | .... | .... | .... | .94 | .94 | .72 |
| 26-26.9 | * .80 | .... | .... | .... | .... | .... | .... | .96 | .96 | .74 |
| 27-27.9 | *.82 | .... | .... | .... | .... | .... | .... | .98 | .98 | .76 |
| 28-28.9 | * .84 | .... | .... | .... | .... | .... | .... | 1.00 | 1.00 | .78 |
| Below 29 | .84 | $ .79 | $ .79 | .... | .... | .... | $ .84 | .... | .... | .... |
| 29-29.9 | .86 | .81 | .81 | .... | .... | .... | .86 | 1.02 | 1.02 | .80 |
| 30-30.9 | .88 | .83 | .83 | .... | .... | .... | .88 | 1.04 | 1.04 | .82 |
| 31-31.9 | .90 | .85 | .85 | .... | .... | .... | .90 | 1.06 | 1.05 | .84 |
| 32-32.9 | .92 | .87 | .87 | .... | .... | .... | .92 | 1.08 | 1.06 | .86 |
| 33-33.9 | .94 | .89 | .89 | .... | .... | .... | .94 | 1.10 | 1.07 | .88 |
| 34-34.9 | .96 | .91 | .91 | .... | .... | .... | .96 | 1.12 | 1.08 | .90 |
| Below 35 | .... | .... | .... | $ .79 | $ .69 | .... | .... | .... | .... | .... |
| 35-35.9 | .98 | .93 | .93 | .81 | .71 | $1.09 | .98 | 1.12 | 1.09 | .92 |
| 36-36.9 | 1.00 | .95 | .95 | .83 | .73 | 1.11 | 1.00 | 1.12 | 1.10 | .94 |
| 37-37.9 | 1.02 | .97 | .97 | .85 | .75 | 1.13 | 1.02 | 1.12 | 1.11 | .96 |
| 38-38.9 | 1.04 | .99 | .99 | .87 | .77 | 1.15 | 1.04 | 1.12 | 1.12 | .98 |
| 39-39.9 | 1.06 | 1.01 | 1.01 | .89 | .79 | 1.17 | 1.06 | 1.12 | 1.13 | 1.00 |
| 40 and over | 1.08 | 1.03 | 1.03 | .91 | .81 | 1.19 | 1.08 | 1.12 | 1.14 | 1.02 |

Effective December 3, 1934, Panhandle Refining Co., purchasing oil in North Texas, posted below 29 degrees, 68 cents; 29-29.9 degrees, 78 cents, with 2 cents added for each additional degree up to 40 and over, 92 cents.

*The following companies purchasing crude oil in Kansas or Oklahoma, or both, begin their price schedule: Below 25°, 76 cents; 25-25.9°, 78 cents, with 2 cents added for each degree upward to 40 and over at $1.08; Carter Oil Co., Magnolia Petroleum Co., Pure Oil Co., Rock Island Refining Co., Shell Petroleum Corp., Sinclair Prairie Oil Marketing Co., Skelly Oil Co., and Wilcox Oil & Gas Co. All others begin their schedules at below 29°, 84 cents, excepting Phillex Oil Co., which begins with below 31° at 88 cents.

Column 1—Effective September 29, 1933, Texas Co. of Oklahoma; Stanolind Crude Oil Purchasing Co. in Kansas and Oklahoma; Anderson & Prichard, Inc., in Oklahoma; Bell Oil & Gas Co. in Oklahoma; Carter Oil Co. in Oklahoma and Kansas; Deep Rock Oil Co. in Oklahoma; Derby Oil Co. in Kansas; Globe Refining Co. in Oklahoma; Golden Rule Refining Co. in Kansas; Gypsy Oil Co. in Oklahoma and Kansas; Kanotex Refining Co. in Kansas; Magnolia Petroleum Co. in Oklahoma; Mid-Continent Petroleum Corp. in Oklahoma; National Refining Co. in Kansas and Oklahoma; Shell Petroleum Corp. in Kansas and Oklahoma; Sinclair Prairie Oil Marketing Co in Kansas and Oklahoma; Texas Co. in Oklahoma; Tide Water Oil Co. in Oklahoma; Vickers Refining Co. in Kansas; Continental Oil Co. in Kansas and Oklahoma; Empire Pipe Line Co. in Oklahoma and Kansas; Phillex Oil Co. in Kansas and Oklahoma; Pure Oil Co. in Oklahoma; Skelly Oil Co. in Kansas. Effective September 29, by White Eagle Oil Corp. in Kansas; October 1, by Barnsdall Refineries, Inc., in Oklahoma.

Column 2—Effective September 29, 1933, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Sinclair Prairie Oil Marketing Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Bell Oil & Gas Co., Continental Oil Co. Effective January 14, 1935, in the Van Pool, Van Zandt County, Pure Oil Co. posted below 29°, 79 cents, with 2 cents added for each degree up to 40 and over at $1.03.

Column 3—Effective September 29, 1933, by Texas Co., Magnolia Petroleum Co., Gulf Refining Co. Effective December 22, Stanolind Oil & Gas Co. in Pine Island, Louisiana, and Marion County, Texas, posted below 29°, 79 cents, with 2 cents added for each degree up to 40 and over at $1.03. Effective March 17, 1934, by Standard Oil Co. of Louisiana and Louisiana Oil Refining Co. Starting with below 28°, 71 cents, adding 2 cents for each degree upward to 40 and over at $1.03

Column 4—Effective September 29, 1933, by Texas Co., Humble Oil & Refining Co., Magnolia Petroleum Co., Sinclair Prairie Oil Marketing Co., and H. F. Wilcox Oil & Gas Co. On same day, Phillex Oil Co. posted below 31°, 71 cents, with 2 cents added for each degree up to 40 and over at 91 cents. Effective June 1, 1934, Texas Co. (see note above).

Column 5—Effective September 29, 1933, by Texas Co., Humble Oil & Refining Co., Gulf Pipe Line Co., Magnolia Petroleum Co., Wilcox Oil & Gas Co., Continental Oil Co. On same day, Phillex Oil Co. posted below 31°, 61 cents, with 2 cents added for each degree upward to 40 and over at 81 cents. Effective June 1, 1934, Texas Co. (see note above).

Column 6—Effective September 29, 1933, by Humble Oil & Refining Co. and Tide Water Oil Co., and on September 30 by Texas Co., which on September 29 had posted a schedule of $1.07 to $1.12 with a 1-cent spread on each degree.

Column 7—Effective September 29, 1933, by Stanolind Oil & Gas Co.

Column 8—Effective September 29, 1933, by Humble Oil & Refining Co., Gulf Pipe Line Co., Shell Petroleum Corp., Pure Oil Co., Sinclair Prairie Oil Marketing Co. On October 2, Magnolia Petroleum Co. posted Lockport, Louisiana, 26-26.9°, 84 cents, with 2 cents added for each degree upward to 34 and over at $1.12; and in Cameron Meadows and Iowa, Louisiana, below 26°, 72 cents, with 2 cents added for each degree up to 34 and over at $1.02. These prices were 2 cents higher on each degree than Magnolia prices posted on September 29. Effective September 29, Shell Petroleum Corp. posted in Iowa, Louisiana, district: Below 26°, 70 cents, with 2 cents added for each degree upward to 34° and over at $1; and in Black Bayou and White Castle, Louisiana: Below 26°, 80 cents, with 2 cents added for each degree upward to 34° and over at $1.10.

Column 9—Effective September 29, 1933, Texas Co. (On September 29 Texas Co. has posted a schedule of 2 cents on each degree, but changed it on September 30.)

Column 10—Effective September 29, 1933, by Louisiana Oil Refining Co.

(California Crude Oil Prices on Page 97)

## Crude Oil Prices

### Oklahoma, Kansas, North Central and East Central Texas

| | |
|---|---|
| East Texas | $1.00 |
| Corsicana (heavy) (June 17, 1933)* | .40 |
| Other fields | (See gravity table) |

Note—In East Texas, effective September 29, 1933, by Texas Co., Stanolind Crude Oil Purchasing Co., Humble Oil & Refining Co., Shell Petroleum Corp., Gulf Pipe Line Co., Tide Water Oil Co., Sinclair Prairie Oil Marketing Co., Magnolia Petroleum Co., Sun Oil Co., Panola Pipe Line Co., Empire Oil & Refining Co., and Atlas Pipe Line Co. posted 60 cents per barrel in East Texas but on November 3 resumed its posted price of $1 per barrel, making it retroactive to October 22.

*Magnolia Petroleum Co.

### West Texas

| | |
|---|---|
| Crane, Upton, Crockett, Howard, Glasscock, Mitchell (Sept. 29, 1933) | $ .70 |
| Ector, Winkler and Pecos Counties and Lea County, New Mexico (Sept. 29, 1933) | .75 |
| Pecos County, Yates shallow Pool (Sept. 29, 1933)* | .65 |
| Jones and Fisher Counties*. See gravity table | |

Note — Effective September 29, 1933, by Humble Oil & Refining Co., Texas Co., Gulf Pipe Line Co., Shell Petroleum Corp., Magnolia Petroleum Co., and by Stanolind Oil & Gas Co. in Winkler County, Texas.

*Shell Petroleum Corp.

### Gulf Coast

Grade A and Grade B specification discontinued by leading buyers.

| | |
|---|---|
| | (See gravity table) |
| Tomball (see note)* | $1.10 |
| Livingston (Sept. 29, 1933)† | 1.00 |
| Cleveland (Jan. 11, 1934) | 1.00 |
| Greta (Sept. 29, 1933) | .85 |
| Refugio, light | (See gravity table) |
| Refugio, heavy (Sept. 29, 1933)‡ | .85 |
| Markham and High Island | (See Gulf Coast gravity table) |
| Conroe | (See Conroe gravity table) |
| Bosco, La. (Jan. 13, 1935)§ | $ .90 |

Note—Tomball, effective September 29, by Humble Oil & Refining Co. and October 2 by Magnolia Petroleum Co., and November 10 by Stanolind Crude Oil Purchasing Co.

*Greta posted by Texas Co. †Shell Petroleum Corp. ‡Refugio heavy by Humble Oil & Refining Co. Cleveland (Liberty County) posted by Magnolia Petroleum Co. §Bosco posted by Pure Oil Co.

### South Central and Southwest Texas

(See note below table)

| | |
|---|---|
| Darst Creek | $ .87 |
| Mirando | .40 |
| Luling (Sept. 29, 1933) | .75 |
| Pettus | 1.05 |
| Salt Flat | .87 |
| Lytton Springs (Sept. 29, 1933) | .95 |
| Duval County (Sept. 29, 1933) | .40 |
| Saxet | .85 |

Note—Effective on September 29 by Humble Oil & Refining Co. in Darst Creek, Mirando, Pettus, Salt Flat and Saxet. Effective September 29 in Darst Creek by Gulf Pipe Line Co. and Texas Co. Effective October 2 by Magnolia Petroleum Co. Effective in Pettus and Salt Flat on September 29 by Humble Oil & Refining Co. and Gulf Pipe Line Co. Luling and Lytton Springs by Magnolia Petroleum Co. Duval County by Texas Co. Saxet, effective September 29 by

(Continued on Page 97)

# TANK WAGON MARKETS

Quotations for gasoline and kerosene in United States, as furnished by the larger marketing concerns, include taxes

June 11, 1935

### Taxes

The gasoline quotations given in the following tables include the 1-cent federal tax, as well as state, county and city taxes. The gasoline quoted is the regular or standard grade. In most marketing areas a third grade and a premium grade are also available.

### Discounts

Under the standard form of commercial consumer contract which went into effect March 1, 1934, save in California, Oregon, Washington, Arizona and Nevada, a discount of 1 cent a gallon off tank wagon or 2 cents a gallon off retail prices is permitted for purchases running between 4,000 and 10,000 gallons a month, or 4 cents a gallon off retail prices for purchase in lots of more than 10,000 gallons a month. The minimum delivery is 25 gallons.

### Standard Oil Co. (Indiana)

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Chicago | 15 2 | 17.2 | 4.0 | 9.8 |
| Decatur, Ill. | 15 2 | 17.2 | 4.0 | 9.8 |
| E. St. Louis | 14.9 | 16 9 | 4.0 | 9.5 |
| Joliet | 15.2 | 17.2 | 4.0 | 9 8 |
| Peoria | 15 2 | 17.2 | 4.0 | 9.8 |
| Quincy | 15.0 | 17.0 | 4.0 | 9.6 |
| Davenport, Ia. | 15.2 | 17.2 | 4.0 | 9.8 |
| Des Moines | 15.0 | 17.0 | 4.0 | 9.6 |
| Mason City | 15.4 | 17.4 | 4.0 | 10.0 |
| Sioux City | 15.2 | 17.2 | 4.0 | 9.8 |
| Duluth, Minn. | 16.0 | 18.0 | 4.0 | 10.6 |
| Mankato | 15.6 | 17.6 | 4.0 | 10.2 |
| Minneapolis | 15.6 | 17.6 | 4.0 | 10.2 |
| LaCrosse, Wis. | 16 6 | 18.6 | 5.0 | 10.2 |
| Green Bay | 16.9 | 18.9 | 5.0 | 10.5 |
| Milwaukee | 16.5 | 18.5 | 5.0 | 10.1 |
| Madison | 16.6 | 18.6 | 5.0 | 10.2 |
| Detroit, Mich. | 16 7 | 18.7 | 4.0 | 9.8 |
| Grand Rapids | 16.6 | 18.6 | 4.0 | 10.5 |
| Saginaw | 16.8 | 18.8 | 4.0 | 9.3 |
| Evansville, Ind. | 16.9 | 18 9 | 5.0 | 10.3 |
| Indianapolis | 17 1 | 19 1 | 5 0 | 10.5 |
| South Bend | 17.3 | 19.3 | 5.0 | 12.0 |
| Fargo, N. Dak. | 16 6 | 18.6 | 4 0 | 11.2 |
| Huron, S. Dak. | 17 1 | 19.1 | 5.0 | 10.7 |
| Sioux Falls | 16.6 | 18.6 | 5.0 | 10.2 |
| Kans. Ci., Mo.* | 14 6 | 16 6 | 4.0 | 9 2 |
| Springfield | 14 3 | 16.3 | 4.0 | 8.9 |
| St. Louis | 14 9 | 16.9 | 3.5 | 9 5 |
| St. Joseph* | 14 6 | 16 6 | 4.0 | 9.2 |
| Wichita, Kans. | 14 1 | 13 9 | 4.0 | 6.3 |
| Bartlesville, Okla. | 16.0 | 18.0 | 5.0 | 8.8 |

*State tax 2 cents, 1-cent city tax and 1-cent federal tax.

Discounts to dealers: Undivided accounts, 1½ cents on premium and regular and 2½ cents on third grade off service station prices; divided accounts one-half cent less than undivided. Where prices are more than 1 cent below normal, the discounts are one-half cent less than above.

### Stanolax Furnace Oil in Chicago

Effective May 28, 1935, f.o.b. Chicago tank wagon prices: Range oil, less than 100 gallons, 8.8 cents; 100-149 gallons, 7.8 cents; 150 gallons and more, 7.3 cents. No. 1 (36-40 R. stw. zero), less than 100 gallons, 8.8 cents; 100-149 gallons, 7.8 cents; 150 gallons or more, 7.3 cents; No. 2 (30-34, stw. zero), same prices and quantities as No. 1; No. 3 (22-26, zero), less than 150 gallons, 7.5 cents; 150 gallons or more, 6.5 cents. No. 4 (12-16 zero), less than 400 gallons, 7.5 cents; 400 gallons or more, 6.5 cents; viscosity of No. 4, 35 and 100° F.; No. 5, less than 400 gallons, 5¾ cents; 400 gallons or more 4¾ cents.

### Southern District

STANDARD OIL CO. (KENTUCKY)

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Atlanta, Ga. | 19 0 | 21.0 | 7.0 | 12 0 |
| Augusta | 19 0 | 20.0 | 7.0 | 13.0 |
| Macon | 19.5 | 21.0 | 7.0 | 13.0 |
| Savannah | 18 5 | 20 5 | 7 0 | 14 0 |
| Birm'ham, Ala. | 21.0 | 23 0 | 8.0 | 12 0 |
| Mobile | 20.0 | 22.0 | 8.0 | 11.0 |
| Montgomery | 22 0 | 24 0 | 8.0 | 13 5 |
| Jackson, Miss. | 19 0 | 21 0 | 7.0 | 11 0 |
| Vicksburg | 18 5 | 20.0 | 7 0 | 12.0 |
| Jack'ville, Fla. | 18.5 | 20 5 | 8 0 | 11 5 |
| Miami | 18 5 | 20 5 | 8 0 | 13 5 |
| Pensacola | 20.0 | 22 0 | 8.0 | 11.5 |
| Tampa | 18.5 | 20 5 | 8 0 | 13 5 |
| Lexington, Ky. | 19.5 | 21.5 | 6.0 | 10.0 |
| Covington | 18.0 | 20 0 | 6.0 | 11.5 |
| Louisville | 18.5 | 20.5 | 6.0 | 10.0 |
| Paducah | 18.5 | 20.5 | 6.0 | 10.0 |

In addition to the state tax of 4 cents on gasoline, Montgomery has city and county tax of 2 cents on gasoline and one-half cent on kerosene. Kerosene prices in Georgia and Mississippi include 1 cent state tax; in Alabama, an inspection fee of one-half cent on kerosene and one-fortieth cent on gasoline; in Florida an inspection fee of one-eighth cent on kerosene and gasoline. To Pensacola, Mobile and Birmingham state taxes on gasoline add 1 cent city tax.

### Rocky Mountain District

CONTINENTAL OIL CO.

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Denver, Colo. | 18 0 | 20.0 | 5.0 | 13.0 |
| Pueblo | 17.0 | 19 0 | 5.0 | 13.0 |
| Grand Junction | 20.5 | 22.5 | 5.0 | 15.0 |
| Casper, Wyo. | 18 5 | 20.5 | 5.0 | 11.5 |
| Cheyenne | 18.5 | 20.5 | 5.0 | 13.0 |
| Butte, Mont. | 21.0 | 23.0 | 5.0 | 17.5 |
| Billings | 20.5 | 22.5 | 6.0 | 16.5 |
| Helena | 21.5 | 23.5 | 6.0 | 17.5 |
| Great Falls | 20.5 | 22.5 | 6.0 | 17.5 |
| Salt Lake, Utah | 21 0 | 23 0 | 5.0 | 16 0 |
| Boise, Idaho | 22.5 | 24.5 | 6.0 | 18.0 |
| Twin Falls | 22.5 | 24.5 | 6.0 | 18 0 |
| Albu'que, N. M. | 20.0 | 22.0 | *6.5 | 13.0 |

*One-half cent city tax.

Effective March 1, 1934, discount to dealers with or without contract throughout Continental territory: Undivided dealer discount off service station price, 4 cents; divided dealer accounts, 3½ cents.

### Southwestern District

MAGNOLIA PETROLEUM CO.

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Dallas, Tex. | 15.0 | 17.0 | 5.0 | 8.0 |
| Fort Worth | 15.0 | 17.0 | 5.0 | 8 0 |
| Houston | 15 0 | 17.0 | 5.0 | 8.0 |
| San Antonio | 15.0 | 17.0 | 6.0 | 8.0 |
| El Paso | 17.0 | 19.0 | 5.0 | 10.0 |
| Muskogee, Okla. | 16.0 | 18.0 | 5.0 | 8.0 |
| Okla. City | 16.0 | 18.0 | 5 0 | 8 0 |
| Tulsa | 16.0 | 18.0 | 5 0 | 8 0 |
| Ft. Smith, Ark. | 14.5 | 18.0 | 5.0 | 8.5 |
| Little Rock | 17 0 | 20.0 | 7.5 | 8.5 |
| Texarkana | 15.5 | 17.5 | 5.0 | 8.0 |

### Atlantic Coast District

STANDARD OIL CO. OF NEW JERSEY

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Atl'tic City, N.J. | 14.0 | 17.5 | 4.0 | 9.0 |
| Newark | 13.3 | 16.8 | 4.0 | 7.5 |
| Annapolis, Md. | 14.8 | 18.3 | 5.0 | 10.0 |
| Baltimore | 14.3 | 17.8 | 5.0 | 8.5 |
| Cumberland | 15.8 | 19.3 | 5.0 | 12.7 |
| Wash'g'n, D. C. | 12.3 | 15.8 | 3.0 | 9.5 |
| Danville, Va. | 16.6 | 20.1 | 6.0 | 12.9 |
| Norfolk | 15.1 | 18.6 | 6.0 | 11.3 |
| Petersburg | 15.8 | 19.3 | 6.0 | 11.4 |
| Richmond | 15 8 | 19.3 | 6.0 | 11.7 |
| Roanoke | 16.8 | 20.3 | 6.0 | 13.9 |
| Charles'n, W.Va. | 15.0 | 18.5 | 5.0 | 12.6 |
| Parkersburg | 14.3 | 17.8 | 5.0 | 11.2 |
| Wheeling | 15.5 | 19.0 | 5.0 | 12.2 |
| Charlotte, N. C. | 18.4 | 21.9 | 7.0 | 13.6 |
| Hickory | 18.7 | 22.2 | 7.0 | 13.7 |
| Mt. Airy | 18.25 | 21.5 | 7.0 | 13.8 |
| Raleigh | 18.2 | 21.7 | 7.0 | 13.8 |
| Salisbury | 17.5 | 20.0 | 7.0 | 13.6 |
| Charleston, S.C. | 16.2 | 19.7 | 7.0 | 11.8 |
| Columbia | 18 0 | 21.5 | 7.0 | 13.2 |
| Spartanburg | 17.05 | 19.3 | 7.0 | 13.5 |

Effective October 23, tank wagon gasoline refers to dealer instead of retail prices.

Price basis to dealers: Undivided dealers at regular price less one-half cent. Discount for kerosene, 1 cent off tank wagon price for 25 gallons or more under contract (contract not necessary in Baltimore) except in New Jersey, where no discount is given.

### Nebraska

STANDARD OIL CO. OF NEBRASKA

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Omaha | 17 6 | 19.6 | 6 0 | 10 1 |
| McCook | 18 3 | 20 3 | 6 0 | 10.8 |
| Norfolk | 18 0 | 20.0 | 6.0 | 10.5 |
| North Platte | 18 4 | 20.4 | 6.0 | 10.9 |
| Scottsbluff | 19 1 | 21.1 | 6.0 | 11 6 |

Note: Discounts to dealers; where service station gasoline prices are (maximum overall, including rent) as follows: Reliance, 2½ cents; Standard Red Crown, 3½ cents; Red Crown Ethyl, 3¼ cents.

Where service station gasoline prices are below normal, resellers' allowances are reduced one-half of the amount below normal, down to the following (minimum overall, including rent): Reliance, 2 cents; Standard Red Crown, 3 cents; Red Crown Ethyl, 3 cents. Discounts to consumers for tank wagon deliveries covered only by Standard Commercial Consumers Contract, effective January 1, 1935.

### Central South District

STANDARD OIL CO. OF LOUISIANA

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| N. Orleans, La. | 17.5 | 21.0 | ‡8.0 | †13.5 |
| Baton Rouge | 16.5 | 20.0 | †7.0 | 12.5 |
| Alexandria | 17.5 | 21.0 | †*8.0 | 10.5 |
| Lafayette | 18.0 | 21.5 | ‡*8.0 | 12.5 |
| Lake Charles | 18.0 | 21.5 | †*8.0 | 12.5 |
| Shreveport | 16.0 | 19.5 | †7.0 | 12.5 |
| Knoxville, Tenn. | 20.0 | 23.5 | 8.0 | 14.0 |
| Memphis | 18.0 | 21.5 | 8.0 | 11.0 |
| Chattanooga | 19.5 | 23.0 | 8.0 | 11.5 |
| Nashville | 19.0 | 22.5 | 8.0 | 13.5 |
| Bristol | 17.85 | 20.6 | 8.0 | 14.5 |

*Includes city tax of 1 cent.

‡Includes 2-cent parish tax. †Includes 1-cent parish tax.

Effective October 23, tank wagon gasoline refers to dealer instead of retail prices.

Price basis to dealers: Undivided dealers at dealer price less one-half cent.

Louisiana kerosene prices include 1-cent state tax.

### Pacific Coast Territory

STANDARD OIL CO. OF CALIFORNIA.

| | Gasoline: Tank wagon† | Posted retail | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| San Francisco | 16 5 | 18.5 | 4 0 | 11 5 |
| Los Angeles | 12.5 | 14.5 | 4.0 | 10.5 |
| Fresno, Calif. | 16.0 | 18.0 | 4.0 | 12 0 |
| Phoenix, Ariz. | 20.0 | 22 0 | 6.0 | ‡18.0 |
| Reno, Nev. | 18.0 | 20.0 | 5.0 | 13.0 |
| Portland, Ore. | 19.0 | 21.0 | 6.0 | 13.5 |
| Seattle, Wash. | 19.0 | 21.0 | 6.0 | 13.5 |
| Tacoma | 19.0 | 21.0 | 6.0 | 13.5 |
| Spokane | 22.0 | 24.0 | 6.0 | 16.5 |

*Retail prices posted by Standard Stations, Inc., a subsidiary.

†Prices are at company's plant or depots, as company does not operate stations. A 4-cent per gallon discount is given dealers and customers taking tank wagon lots except in Phoenix where the discount is 1 cent.

‡Includes 5-cent state tax.

### Pennsylvania, Delaware and Part of New England

ATLANTIC REFINING CO

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Phil'delphia, Pa. | 15.0 | 17.0 | 4.0 | 9.0 |
| Pittsburgh | 16.0 | 18.0 | 4.0 | 10.0 |
| Allentown | 15.5 | 17.5 | 4.0 | 10.0 |
| Erie | 15.0 | 17.0 | 4.0 | 9.0 |
| Scranton | 16.0 | 18.0 | 4.0 | 10.0 |
| Altoona | 16.0 | 18.0 | 4.0 | 10.0 |
| Dover, Del. | 15.5 | 17.5 | 4.0 | 10.0 |
| Wilmington | 15.5 | 16.5 | 4.0 | 9.0 |
| Springf'd, Mass. | 13.2 | 16.7 | 4.0 | 7.5 |
| Worcester | 13.3 | 16 8 | 4.0 | 7.5 |
| Hartford, Conn. | 12 3 | 15 8 | 3.0 | 7.5 |
| New Haven | 12.2 | 15.7 | 3.0 | 7.5 |
| Providence, R.I. | 12.0 | 15.5 | 3.0 | 7.0 |

Note—Tank wagon prices are those applicable to consumers purchasing lots of 100 or more gallons in one delivery.

### Canada*

**Imperial 3-Star Gasoline**

IMPERIAL OIL, LTD.

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Hamilton, Ont. | 22 0 | 25.0 | 6.0 | 17.5 |
| Toronto, Ont. | 22 0 | 25 0 | 6.0 | 17.5 |
| Brandon, Man. | 30.3 | 33.3 | 7.0 | 21.8 |
| Winnipeg, Man. | 28.7 | 31.7 | 7.0 | 20.2 |
| Regina, Sask. | 30.0 | 33.0 | 7.0 | 21.5 |
| Saskatoon, Sask | 32 8 | 35.8 | 7.0 | 24.3 |
| Edmonton, Alta. | 32.2 | 35.2 | 7.0 | 23 7 |
| Calgary, Alta. | 29 5 | 32 5 | 7 0 | 21.0 |
| Vancouver, B.C. | 27.0 | 30.0 | 7.0 | 24.0 |
| Montreal, Que. | 24.0 | 27.0 | 6.0 | 17.0 |
| St. John, N.B. | 26.0 | 30.0 | 8.0 | 19.5 |
| Halifax, N. S. | 26.0 | 30.0 | 8.0 | 19.5 |

*Imperial gallon used in Canada.

Maritime provinces, all dealers 4 cents off service station price. All other provinces open dealers 3 cents per gallon off service station price, 1 cent additional to 100 per cent accounts.

### Naphths

STANDARD OIL CO (INDIANA)

| | Tank wagon* |
|---|---|
| Oleum spirits | 15.7 |
| V.M.&P. naphtha | 16.0 |
| Cleaners' naphtha | 15 0 |
| Stanisol | 15.0 |

*Prices include 3-cent Illinois tax, but not 1-cent federal tax nor 2 per cent retail occupational tax.

Prices f.o.b. Chicago, March 12, 1935. Each of above prices subject to discount of 1-cent per gallon for 150-gallon lots if covered by contracts.

### New York and New England

SOCONY-VACUUM CO., INC

| | Gasoline: Posted dealer | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Albany, N. Y. | 14.2 | 17.7 | 5.0 | 7.5 |
| *Met. New York | 14.55 | 18.3 | 5.0 | 7.25 |
| *Br'kl'n, Queens | 14.3 | 17.8 | 5.0 | 7.25 |
| Buffalo | 14.7 | 18.3 | 5.0 | 8 0 |
| Rochester | 15.0 | 18.5 | 5.0 | 8.5 |
| Syracuse | 14.5 | 18.0 | 5.0 | 8.5 |
| Boston, Mass. | 11.5 | 13.5 | 4.0 | 7.0 |
| Portland, Me. | 14.5 | 18.0 | 5.0 | 7.5 |
| Manch't'r, N.H. | 14.8 | 18.3 | 5.0 | 8.25 |
| Burlington, Vt. | 16.2 | 19.7 | 5.0 | 8.5 |

*Includes 2 per cent city sales tax.

### Ohio

STANDARD OIL CO. OF OHIO

| | Gasoline: Tank wagon | Service station | Incl'ds tax | Kero. tank wagon |
|---|---|---|---|---|
| Ohio points | 16.5 | 18.5 | 5.0 | *12.5 |

*Includes state tax of 1 cent, effective July 22.

## Retail Price Changes

**Regular-Grade Gasoline and Kerosene**

Standard Oil Co. (Kentucky) May 28 advanced tank wagon and station gasoline 1 cent in Atlanta; May 29, reduced tank wagon gasoline one-half cent and station gasoline 1 cent in Vicksburg; May 30, advanced station gasoline one-half cent in Covington; June 3, advanced tank wagon and station gasoline one-half cent in Lexington, Louisville and Paducah. May 13, reduced tank wagon kerosene 2 cents in Montgomery; May 21, advanced tank wagon kerosene 3 cents in Paducah; May 16, reduced tank wagon kerosene 2½ cents in Vicksburg; May 31, advanced tank wagon kerosene 2 cents in Birmingham.

Standard Oil Co. of California June 5 reduced tank wagon and station gasoline 2 cents in Los Angeles; June 6, additional reduction of one-half cent; June 8, additional reduction of 1 cent.

Standard Oil Co. of New Jersey May 30 advanced tank wagon and station gasoline .2 cent in Annapolis and Baltimore, and station gasoline .2 cent in Cumberland; May 31, advanced tank wagon gasoline 1.2 cents and station gasoline 2.7 cents in Salisbury.

Socony-Vacuum Oil Co., Inc., May 31 reduced posted dealer gasoline 1½ cents and station gasoline 3 cents in Boston; June 4, advanced posted dealer and station gasoline .3 cent in Rochester.

Standard Oil Co. of Louisiana, June 1 in Louisiana and June 3 in Tennessee, advanced tank wagon kerosene one-half cent.

Magnolia Petroleum Co. June 4 reduced tank wagon kerosene one-half cent in Texarkana.

Continental Oil Co. May 24 reduced tank wagon and station gasoline 1 cent in Butte; May 27, made similar reduction in Helena.

*Earl H. Carter, drilling and swabbing contractor of Gladewater, East Texas, and Harry Frazee of the Wilson Manufacturing Co., Shreveport, La.*

# Mid-Continent Refiners Increase Runs to Supply Demand

(Continued from Page 18)

### KANSAS

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Barnsdall Oil Co., Wichita | 4,000 | 2,500 | 3,000 |
| Derby Oil Co., Wichita | 8,000 | 6,000 | 6,000 |
| Dickey Refining Co., McPherson | 5,000 | 1,500 | 2,000 |
| Eldorado Refining Co., Eldorado | 5,000 | 4,000 | 3,500 |
| Falcon Refining Co., Inc., Great Bend | 700 | 500 | 500 |
| Globe Oil & Refining Co., McPherson | 10,000 | 10,000 | 10,000 |
| Kanotex Refining Co., Arkansas City | 12,000 | 5,000 | 6,000 |
| Kansas Gas & Gasoline Co., Winfield | 500 | 200 | 150 |
| Kreuger Refining Co., Laton | 150 | 50 | 50 |
| National Refining Co., Coffeyville | 6,500 | 4,000 | 4,000 |
| Petroleum Products Co., Chanute | 1,000 | 1,000 | 1,000 |
| Phillips Petroleum Co., Kansas City | 18,000 | 12,000 | 11,500 |
| Security Petroleum Co., Chase | 3,100 | (*) | (*) |
| Shell Petroleum Corp., Arkansas City | 20,000 | 17,000 | 17,000 |
| Sinclair Refining Co., Coffeyville | 12,000 | 9,000 | 9,000 |
| Sinclair Refining Co., Argentine | 9,500 | 7,500 | 7,500 |
| Skelly Oil Co., Eldorado | 23,000 | 16,000 | 15,000 |
| Socony-Vacuum Oil Co., Inc., Augusta | 16,000 | 15,000 | 14,500 |
| Standard Oil Co. (Indiana), Neodesha | 20,000 | 4,500 | 4,500 |
| United Oil & Refining Co., Hutchinson | 1,500 | (*) | (*) |
| Vickers Petroleum Co., Potwin | 3,500 | 2,500 | 2,300 |
| Total | 179,450 | 118,250 | 117,610 |

*Shut down.

### EAST TEXAS

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Acme Refining Co., Gladewater | 1,250 | 420 | 700 |
| Adams Refining Co., Big Sandy | 1,000 | 300 | 900 |
| Artex Refining Co., No. 1, Arp | 2,000 | 200 | (*) |
| Bartlett Refining Co., Kilgore | 2,500 | (*) | (*) |
| Beacon Oil & Refining Co., Henderson | 4,000 | 400 | 140 |
| Blue Diamond Refining Co., Gladewater | 1,500 | (*) | (*) |
| Bometa Refining Co., Joinerville | 500 | (*) | (*) |
| Bradley Refining Co., Kilgore | 2,000 | (*) | 100 |
| Carnation Refining Co., Gladewater | 1,500 | 50 | 200 |
| Century Refining Co., Friars Switch | 2,500 | 1,400 | 500 |
| Chief Refining Co., Gladewater | 1,300 | 1,000 | 500 |
| Consolidated Refining Co., No. 2, Gladewater | 2,000 | 400 | 700 |
| Culver Refining Co., No. 1, Gladewater | 4,500 | 500 | 800 |
| Danciger Refineries, Inc., Longview | 10,000 | (*) | (*) |
| Deason Refining Co., Turnerstown | 500 | (*) | (*) |
| East Texas Refining Co., No. 2, Longview | 10,000 | 8,000 | 5,100 |
| East Texas Refining Co., No. 3, Friars Switch | 12,000 | (*) | 600 |
| Foshee Refiners Corp., Gladewater | 1,000 | (*) | 600 |
| Friar Topping & Refining Co., Friars Switch | 2,000 | (*) | (*) |
| Gilliland Refining Co., Gladewater | 4,000 | 2,800 | 1,670 |
| Gilliland Refining Co., Overton | 5,500 | 2,500 | 2,220 |
| Gilmer Refining Co., Gladewater | 1,000 | (*) | (*) |
| Godlin Refining Co., Gladewater | 500 | (*) | (*) |
| Goodson, Gentry, Carles Refining Co., Gladewater | 1,000 | (*) | 200 |
| Hub Oil Refining Co., Reeds Switch | 3,000 | (*) | 80 |
| Humble Oil & Refining Co., Neches | 5,000 | 1,200 | 500 |
| Hunter & Knox Refining Co., Reeds Switch | 750 | (*) | (*) |
| Illinois Refining Co., Kilgore | 1,200 | (*) | 600 |
| Jackson Refining Co., Gladewater | 1,750 | 230 | 300 |
| Johnson Refining Co., No. 1, Kilgore | 1,200 | (*) | (*) |
| Kent Refining Co., Angus | 4,000 | (*) | (*) |
| Keystone Refining Co., Gladewater | 1,250 | 300 | (*) |
| Kilgore Refining Co., Kilgore | 4,000 | 1,300 | 1,200 |
| Kilgore Reclamation Co., Kilgore | 2,000 | (*) | (*) |
| Kiltex Refining Co., Kilgore | 500 | (*) | (*) |
| L. & G. Refining Co., Gladewater | 1,500 | 800 | (*) |
| Lake Refining Co., Gladewater | 2,000 | 2,200 | 1,000 |
| Lapren Refining Co., Kilgore | 2,500 | 1,000 | 800 |
| Lone Star Refining Co., Gladewater | 2,000 | 2,250 | 2,400 |
| London Topping & Refining Co., Overton | 1,000 | (*) | (*) |
| Longregg Refining Co., Kilgore | 500 | (*) | (*) |
| Magnolia Petroleum Co., Corsicana | 5,000 | 3,700 | 3,000 |
| Master Petroleum Co., Waco | 1,000 | 300 | 300 |
| McKain Refining Co., Gladewater | 1,500 | 125 | 1,000 |
| McMurray Refining Co., Arp | 4,000 | 1,000 | (*) |
| Minerva Refining Co., Minerva | 2,000 | 240 | 250 |
| Model Oil & Refining Co., Reeds Switch | 1,250 | (*) | (*) |
| National Refining Co., Camp Switch | 1,000 | (*) | 300 |
| Ocean Refining Co., Kilgore | 2,200 | (*) | (*) |
| Oil Refineries, Inc., Overton | 4,000 | 2,000 | 1,700 |
| Outdoor Refining Co., Kilgore | 900 | (*) | (*) |
| Overton Refining Co., Overton | 3,000 | (*) | 400 |
| Panama Refining Co., Kilgore | 3,000 | (*) | (*) |
| Pelican Refining Co., Gladewater | 750 | (*) | (*) |
| Pelican Refining Co., Gladewater | 1,000 | (*) | (*) |
| Pennant Refining Co., Kilgore | 500 | 300 | (*) |
| Petroleum Processing Co., Friars Switch | 200 | (*) | (*) |
| Phoenix Refining Co., Dallas | 5,000 | (*) | (*) |
| Pine Refining Co., No. 2, Camp Switch | 4,250 | (*) | (*) |
| Pope Refining Co., Gladewater | 1,500 | (*) | (*) |
| Roco Refining Co., Kilgore | 2,000 | (*) | (*) |
| Rusk Oil & Refining Co., Overton | 3,500 | 600 | 700 |
| Shoreline Refining Co., Kilgore | 4,000 | (*) | 900 |
| Simms Oil Co., West Dallas | 4,000 | (*) | (*) |
| Sinclair Refining Co., Camp Switch | 5,000 | 2,000 | 2,000 |
| Smith Refining Co., No. 1, Gladewater | 1,500 | 100 | 500 |
| Southern Oil Refining Co., Tyler | 3,000 | 1,500 | 1,500 |
| Southport Refining Co., Kilgore | 4,000 | 2,400 | 800 |
| Supreme Refining Co., Gladewater | 1,200 | (*) | 700 |
| Texas Co., Dallas | 16,000 | 12,000 | 11,000 |
| Texas Oil Products Co., Gladewater | 2,000 | 1,300 | 1,400 |
| Texas Refining Co., Kilgore | 300 | (*) | (*) |
| Texas State Refining Co., Kilgore | 1,000 | 140 | 500 |
| Thompson & Bridges Refining Co., Gladewater | 1,000 | 50 | 100 |
| Triangle Refining Co., Kilgore | 2,000 | 600 | 400 |
| Trio Refining Co., Arp | 2,100 | 1,300 | 1,400 |
| Tyler, Texas, Producing & Refining Co., Tyler | 15,000 | 1,000 | (*) |
| Tyreco Refining Co., No. 1 Arp | 2,500 | 1,700 | 4,200 |
| Tyreco Refining Co., No. 2, Overton | 2,000 | 700 | (*) |
| Union Refining Co., Kilgore | 3,000 | (*) | (*) |
| Upshur Refining Co., Gladewater | 1,000 | (*) | (*) |
| Utah Refining Co., Kilgore | 2,000 | 250 | 230 |
| Walrip & Stewart Refining Co., Omega | 1,000 | (*) | 100 |
| Washington Refining Co., Kilgore | 500 | (*) | (*) |
| Wichita Refining Co., Gladewater | 1,000 | (*) | (*) |
| Wolfe Refining Co., Kilgore | 1,000 | (*) | (*) |
| Total | 238,300 | 62,115 | 52,690 |

*Shut down.

### ARKANSAS

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Berry Asphalt Co., Waterloo | 2,000 | 1,000 | 950 |
| Henry H. Cross Co., Smackover | 4,000 | 3,500 | 3,500 |
| Lion Oil Refining Co., El Dorado | 12,000 | 9,000 | 8,500 |
| Macmillan Petroleum Products Co., Norphlet | 2,500 | 2,000 | 2,200 |
| Ouachita Valley Refining Co., El Dorado | 2,500 | (*) | (*) |
| Root Refining Co., El Dorado | 10,000 | 5,000 | 5,000 |
| Simms Oil Co., Smackover | 2,000 | (*) | (*) |
| Stephens Refining Co., Stephens | 750 | 250 | 250 |
| Total | 38,550 | 20,750 | 20,400 |

*Shut down.

### SOUTHWEST TEXAS

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Amsco Refining Co., Mirando City | 2,000 | 1,200 | 1,100 |
| Bee Oil & Refining Co., Pettus | 1,000 | 500 | 550 |
| Capital Refining Co., Luling | 2,500 | (*) | (*) |
| Chapa Refining Co., Laredo | 100 | 50 | 50 |
| Citizens Refining Co., Luling | 200 | 50 | 50 |
| Humble Oil & Refining Co., San Antonio | 5,000 | 2,500 | 2,500 |
| Magnolia Petroleum Co., Luling | 7,000 | 5,500 | 6,000 |
| Pettus Refining Co., Pettus | 1,000 | 700 | 750 |
| Phoenix Refining Co., San Antonio | 500 | 500 | 500 |
| Pioneer Oil & Refining Co., Somerset | 2,000 | 900 | 900 |
| Rado Refining & Producing Co., McAllen | 500 | 250 | 200 |
| Texas Co., San Antonio | 3,000 | 3,000 | 3,000 |
| Texas Petroleum Products Co., Somerset | 1,500 | 250 | 250 |
| Total | 26,300 | 15,400 | 15,850 |

*Shut down.

### WEST TEXAS AND PANHANDLE

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Active Oil Co., Arno | 1,500 | (*) | (*) |
| Aero Refining Co., Pecos | 220 | 100 | 100 |
| Coltex Refining Co., Colorado | 12,500 | 8,000 | 8,000 |
| Concho Refining Co., San Angelo | 250 | 100 | 100 |
| Cosden Oil Co., Big Spring | 12,500 | 6,000 | 6,000 |
| Danciger Refineries, Inc., Pampa | 6,500 | 5,500 | 5,000 |
| Gibson Oil Corp., Magic City | 250 | (*) | (*) |
| Howard County Refining Co., Big Spring | 1,500 | 300 | 300 |
| Mertzon Refining Co., Mertzon | 100 | 50 | 50 |
| McNutt Refining Co., El Paso | 2,000 | 750 | 750 |
| Panhandle Refining Co., Kings Mill | 2,000 | 1,400 | 1,400 |
| Paramount Refining Co., San Angelo | 2,000 | (*) | (*) |
| Pasotex Refining Co., El Paso | 14,000 | 7,000 | 6,700 |
| Phillips Petroleum Co., Borger | 50,000 | 20,000 | 19,350 |
| Shamrock Oil & Gas Co., Sunray | 2,000 | 1,500 | 1,500 |
| Shamrock Oil & Gas Co., Meldavis | 1,500 | 1,200 | 1,200 |
| Sinclair Refining Co., El Paso | 2,500 | 600 | 600 |
| Texas Co., El Paso | 2,000 | 1,000 | 900 |
| Texas Co., Amarillo | 4,000 | 3,000 | 3,000 |
| West Texas Refining Co., Pecos City | 6,000 | (*) | (*) |
| Wickett Petroleum Co., Wickett | 2,500 | 600 | 600 |
| Total | 125,820 | 57,100 | 55,550 |

*Shut down.

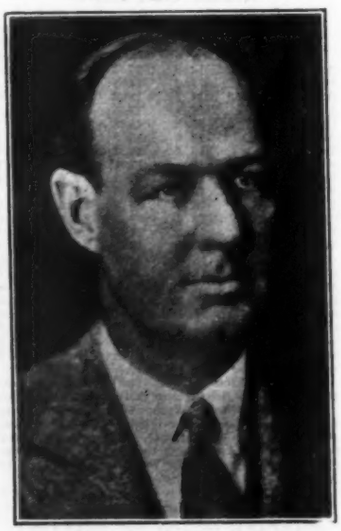
### NORTH LOUISIANA

| Company and location— | Daily capacity | Aver. daily runs— June | May |
|---|---|---|---|
| Acme Refining Corp., Monroe | 100 | 50 | 50 |
| Bayou State Oil Corp., Hoseton | 750 | 150 | 150 |
| Griswold Refining Co., Shreveport | 2,500 | 1,500 | 1,000 |
| Louisiana Oil Refining Co., Shreveport, Bossier | 30,000 | 18,000 | 18,000 |
| Pelican Refining Co., Converse | 100 | 50 | 50 |
| Shoreline Oil Co., Lewis | 1,000 | 1,000 | 900 |
| Spartan Refining Co., Shreveport | 12,000 | (*) | (*) |
| Stanolind Oil & Gas Co., Vivian | 3,500 | 2,000 | 2,000 |
| Texas Co., Shreveport | 7,000 | (*) | (*) |
| Total | 55,450 | 22,750 | 22,150 |

*Shut down.

## Ralph H. Kinsloe Dies; Magnolia Vice President

DALLAS, Tex., June 10.—Ralph H. Kinsloe, 50, vice president and general manager of the Magnolia Petroleum Co.,



RALPH H. KINSLOE

dropped dead here Saturday as he worked in the yard of his home.

He had been connected with the Magnolia company for 23 years, coming to Dallas from Beaumont, seven years ago.

He was born in Fairfield, Iowa, and came to Corsicana, Tex., with his parents when he was 9 years old.

### BANK ELECTS NEW DIRECTORS

The First National Bank of Tulsa has made Elmo Thompson, formerly with the National Bank of Tulsa, a vice president and elevated B. F. Barnett to its board of directors. Mr. Barnett is a vice president of the bank and his election to the board culminates 17 years of valuable service with that institution. Mr. Thompson is a native of Nashville, Tenn., and graduate of Vanderbilt University. He is a lawyer by profession and first entered the services of the old Exchange National Bank in 1921 in the legal department. He was made an officer of that institution in 1926 and has also served as a president of the Tulsa Chamber of Commerce and the Junior Chamber of Commerce. Mr. Barnett has been connected with the First National Bank since 1918, coming from the Central National Bank of Tulsa. Mr. Barnett started his banking career in Osceola, Mo., his home town, and has devoted his entire business career to banking.

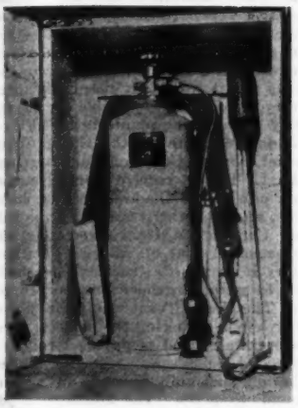
*C. D. Buffett, district engineer, Stanolind Oil & Gas Co., Perry, Okla.*

# NATURAL GASOLINE MANUFACTURE

## Propane Torch Used for Fighting Forest Fires

Propane torches have become the accepted equipment of the Federal Government's forest rangers for combatting forest fires. The effectiveness of the torch was proved not so long ago when its use halted the complete destruction of Selway Forest of Idaho and kept the fire from entering adjacent areas. The work of the propane torch is enumerated in the "Standard Oil Bulletin," the house organ of the Standard Oil Co. of California and the following is taken from the bulletin:

"Carlessness on the part of campers and hunters is a constant summertime



*Propane gas torch equipment used by Forest Rangers*

menace to the woods. Since it took charge of the national forests in 1905, the Forest Service has carried on a campaign of education, hammering constantly on this theme: Be careful with matches, cigarets, pipes, campfires—it's a very high form of sportsmanship. But some men will be careless, and nature is unfeeling. There will always be forest fires, and for this reason the Forest Service is constantly on the lookout to find or perfect new methods of combating them. Such a search brought the Calol gas torch into the forests of the Northwest.

"The idea originated in district No. 1 of the U. S. Forest Service, with headquarters in Missoula, Mont., and supervision over 26 national forests in Washington, Idaho, Montana and South Dakota. Kerosene, gasoline and butane torches had been tried, when, in 1931, alert forest officers became interested in Standard's newly developed Calol heating torch, as used in garages, in burning roadside weeds, in removing paint from buildings, and as a 'Firekil' torch by poultry raisers. It was frankly an experiment at first. Conferences were held between Forest Service experts and Standard engineers to discuss cylinder sizes, pressures, safety features, burners, etc., and the company made a series of experiments with different metals before the present alloy burner was developed. The success of the perfected torch was so great that it was adopted as standard equipment for Forest Service backfiring and brush-burning.

"The compact, efficient propane gas torch consists of a special small Calol gas cylinder attached to a pack-frame, a copper tube that extends to the operator's belt, where a valve is located for quick control, a short length of quarter-inch hose, and a combined mixing-chamber and burner creating a super-hot blow-torch type of flame. The entire outfit, in-

(Continued on Page 108)

## Production of Natural Gasoline Shows Continued Decline in Important Areas

The production of natural gasoline again declined, the daily average for April being 4,279,000 gallons, compared with an average of 4,367,000 gallons for March, according to a report prepared by the Bureau of Mines for Petroleum Administrator Harold L. Ickes. Production of Oklahoma increased, that in the Panhandle was virtually unchanged but the remainder of Texas and California showed a material decrease. Stocks of natural gasoline again increased, the total on hand April 30 being 234,594,000 gallons compared with 220,567,000 gallons on hand March 31. Stocks at plants and terminals continued to show the largest increases, reflecting the seasonal decline in sales.

Exports of natural gasoline declined from 13,733,000 gallons in March to 7,086,000 gallons in April, but shipments to jobbers and refinery-owned bulk plants increased from 9,158,000 gallons to 9,300,000 gallons.

Due to seasonal influences the average vapor pressure of the "direct" shipments declined from 17.8 pounds in March to 15.1 pounds in April. The average of the April shipments to refinery-owned bulk plants was 10.9 pounds, a figure almost as low as that of many grades of refinery gasoline.

**PRODUCTION AND STOCKS BY FIELDS**

(Thousands of gallons)

| | Production | | | | Stocks Apr. 30, 1935 | | Stocks Mar. 31, 1935 | |
|---|---|---|---|---|---|---|---|---|
| | Apr., 1935 | Mar., 1935 | Jan.-Apr., 1935 | Jan.-Apr., 1934 | At refineries | At plants and terminals | At refineries | At plants and terminals |
| East Coast | ..... | ..... | ..... | ..... | 10,458 | ..... | 9,030 | ..... |
| Appalachian | 5,623 | 5,850 | 24,435 | 23,000 | 378 | 5,500 | 504 | 4,893 |
| Ind., Ill., Ky., etc. | 810 | 920 | 3,463 | 3,000 | 1,506 | 478 | 2,184 | 344 |
| Oklahoma | 30,398 | 30,103 | 117,852 | 122,300 | 3,192 | 17,418 | 2,898 | 14,267 |
| Oklahoma City | 9,041 | 9,147 | 36,039 | 36,400 | (*) | 3,608 | (*) | 4,049 |
| Osage County | 4,060 | 3,934 | 15,160 | 14,400 | (*) | 5,798 | (*) | 4,469 |
| Seminole | 7,875 | 7,691 | 30,025 | 29,300 | (*) | 3,485 | (*) | 2,295 |
| Rest of State | 9,422 | 9,331 | 36,628 | 42,200 | (*) | 4,527 | (*) | 3,454 |
| Kansas, Mo., etc. | 2,803 | 2,655 | 10,838 | 9,100 | 168 | 1,178 | 546 | 729 |
| Texas | 40,758 | 42,181 | 165,872 | 140,300 | 12,432 | 53,211 | 11,214 | 40,767 |
| Gulf | 1,956 | 2,102 | 9,057 | (†) | 12,012 | 16,172 | 10,668 | 8,712 |
| East Texas | 5,041 | 5,101 | 19,687 | 9,900 | (*) | 514 | (*) | 625 |
| Panhandle | 22,192 | 23,758 | 94,567 | 77,500 | (*) | 32,341 | (*) | 26,979 |
| North Texas | 3,012 | 2,221 | 8,221 | 7,300 | (*) | 833 | (*) | 876 |
| West Central | 6,164 | 6,549 | 25,042 | 29,500 | (*) | 2,890 | (*) | 2,836 |
| Rest of State | 2,383 | 2,440 | 9,298 | 16,100 | (*) | 461 | (*) | 739 |
| Louisiana | 3,481 | 3,572 | 14,811 | 14,000 | 84 | 3,456 | 84 | 8,431 |
| Arkansas | 1,139 | 1,168 | 4,249 | 4,300 | 168 | 219 | 252 | 227 |
| Rocky Mountain | 4,126 | 4,419 | 17,348 | 19,000 | 882 | 1,320 | 840 | 1,325 |
| California | 39,220 | 44,512 | 166,877 | 150,100 | 118,944 | 3,302 | 118,356 | 3,676 |
| Huntington Beach | 3,141 | 3,205 | 12,247 | 11,700 | (*) | (*) | (*) | (*) |
| Kettleman Hills | 11,504 | 14,705 | 54,382 | 47,800 | (*) | (*) | (*) | (*) |
| Long Beach | 6,397 | 6,614 | 25,081 | 24,000 | (*) | (*) | (*) | (*) |
| Santa Fe Springs | 4,563 | 4,865 | 18,389 | 20,700 | (*) | (*) | (*) | (*) |
| Ventura Avenue | 3,067 | 3,793 | 14,551 | 14,600 | (*) | (*) | (*) | (*) |
| Rest of State | 10,548 | 11,329 | 42,227 | 40,300 | (*) | (*) | (*) | (*) |
| Total | 128,358 | 135,380 | 525,745 | 494,100 | 148,512 | 86,082 | 145,908 | 74,699 |
| Daily average | 4,279 | 4,367 | 4,381 | 4,120 | ..... | ..... | ..... | ..... |
| Total (thousands of barrels) | 3,056 | 3,223 | 12,517 | 11,764 | 3,536 | 2,050 | 3,474 | 1,778 |
| Daily average | 102 | 104 | 104 | 98 | ..... | ..... | ..... | ..... |

*Not available. †Included under "Rest of State."

**RECEIPTS AND DELIVERIES OF NATURAL GASOLINE, APRIL, 1935**

(Thousands of gallons)

| | Delivered from | | | | Receipts | | |
|---|---|---|---|---|---|---|---|
| | At refineries | To refinery-owned bulk plants | To jobbers and retailers | Exports | At refineries | At refinery-owned bulk plants | By jobbers and retailers |
| East Coast | ..... | ..... | ..... | ..... | 3,641 | 36 | 245 |
| Appalachian | 2,417 | 376 | 1,626 | 337 | 846 | 365 | 917 |
| Ind., Ill., Ky., etc. | 525 | ..... | 451 | 14 | 11,169 | 696 | 2,104 |
| Oklahoma | 24,594 | 572 | 1,172 | 82 | 15,094 | 12 | 653 |
| Kans., Mo., etc. | 2,089 | 123 | 38 | ..... | 9,237 | 398 | 585 |
| Texas Inland | 19,890 | 510 | 2,101 | 195 | | | |
| Texas Gulf | 1,732 | ..... | ..... | } | 16,076 | 73 | 1,319 |
| La. and Ark. | 5,566 | ..... | 1,165 | 3,705 | 2,056 | ..... | 757 |
| Rocky Mountain | 4,037 | 6 | 71 | ..... | 2,731 | 6 | 144 |
| California | 35,690 | ..... | 1,089 | 2,752 | 35,690 | 1 | 1,089 |
| Total | 96,540 | 1,587 | 7,713 | 7,086 | 96,540 | 1,587 | 7,713 |
| Daily average | 3,215 | 53 | 257 | 236 | 3,215 | 53 | 257 |
| Total (thousands of barrels) | 2,299 | 38 | 184 | 169 | 2,299 | 38 | 184 |
| Average V.P. | 20.0 | 10.9 | 15.9 | 19.7 | 20.0 | 10.9 | 15.9 |

**DETAIL OF SHIPMENTS TO JOBBERS, RETAILERS AND REFINERY-OWNED BULK PLANTS, APRIL, 1935**

(Thousands of gallons)

| Point of delivery— | Texas | Minn. | W. Va. | Okla. | Ark. | Ohio | Other | Total |
|---|---|---|---|---|---|---|---|---|
| Texas | 1,109 | 696 | ..... | ..... | ..... | ..... | 806 | 2,611 |
| Oklahoma | 9 | 167 | ..... | 589 | ..... | 8 | 971 | 1,744 |
| West Virginia | ..... | ..... | 730 | ..... | ..... | 93 | 628 | 1,451 |
| California | ..... | ..... | ..... | ..... | ..... | ..... | 1,089 | 1,089 |
| Arkansas | ..... | ..... | ..... | ..... | 549 | ..... | 50 | 599 |
| Louisiana | 174 | 16 | ..... | 73 | 24 | ..... | 279 | 566 |
| Other | ..... | 29 | 4 | 2 | ..... | 466 | 758 | 1,259 |
| Total | 1,292 | 908 | 734 | 664 | 573 | 567 | 4,581 | 9,299 |

## Fuel Volatility to Be Discussed Before S.A.E.

Natural gasoline manufacturers, refiners and automotive engineers will be afforded another opportunity to discuss their common problems as they gather at White Sulphur Springs, W. Va., next week to attend the thirtieth annual meeting of the Natural Gasoline Association of America in Tulsa. A number of prominent automotive engineers were in attendance upon invitation and discussed their problems in motor fuel volatility, and vapor locking. Again, these subjects will come up for discussion and on June 20 and 21 the Automotive Society program calls for a symposium on motor fuel volatility. Under H. F. Huf, chairman, the group will hear papers by J. O. Eisinger and D. P. Barnard of the Standard Oil Co. of Indiana on "A Forgotten Property of Gasoline"; H. W. Field and M. J. Fowle of the Atlantic Refining Co. will present a paper on the "Economics of Fuel Volatility"; Neil MacCoull and E. M. Barber of the Texas Co. will present "Fuel Volatility Limitations Imposed by Vapor Lock"; "What Price Dynamite," by C. H. Jorgensen of Delco-Remy Corp., and "Trends in Automotive Design as Influenced by Fuel Volatility" by J. M. Campbell, W. G. Lovell and T. A. Boyd, of the General Motors Corp. It might be necessary to carry over certain of these papers and some of their discussion, and provision has been made for this in the program for the following day.

However, on Friday a regular schedule of papers have been provided and with D. P. Barnard as chairman the group will meet in the morning to hear a report on "Extreme Pressure Lubricants" by W. S. James of the Studebaker Corp. to be followed by what discussion of motor fuel volatility might remain.

Mid-Continent natural gasoline manufacturers and refiners are planning to attend the meeting and to present written discussions of papers to be presented. The open discussion from the floor will also prove to be a feature of the meeting.

At a meeting of the co-operative fuel research subcommittee on volatility scheduled for 4:30 Thursday, J. B. Macauley, chairman, will hear definite recommendations to be presented by the Natural Gasoline Association and the Western Petroleum Refiners Association regarding motor fuel specification and future research.

The members of the C.F.R. subcommittee include A. E. Becher of the Standard Oil Development Co., T. A. Boyd of the General Motors Corp., O. C. Bridgeman of the Bureau of Standards and G. G. Oberfell of the Phillips Petroleum Co.

C. B. Veal, research manager, is making special provisions for this meeting.

### AUTO PRODUCTION HIGHER

Motor vehicle production for the first five months of this year totaled 1,988,637, an increase of 35 over the same period last year. The May total of 377,754 units represented a gain of 8 per cent over the same month last year. Following is the production by months, according to the Automobile Manufacturers Association:

| Month— | 1935 | 1934 |
|---|---|---|
| January | 308,424 | 162,570 |
| February | 353,813 | 238,827 |
| March | 451,809 | 352,614 |
| April | 501,837 | 371,328 |
| May | 377,754 | 350,616 |
| Total | 1,988,637 | 1,475,965 |

## Late Fields

### OKLAHOMA

Late new wells in the Fitts Pool include Phillips Petroleum Co.'s No. 10 Norris, SE NW SW Section 25-2-6, 641 bbls. in three hours through tubing; Stanolind Oil & Gas Co.'s No. 6-E Norris, SW cor. SE Section 25-2-6, 1,633 bbls. in eight hours through casing; E. H. Moore and others' No. 5 Akers, NE SE NE Section 36-2-6, 486 bbls. in two hours through casing; Carter Oil Co.'s No. 14 Richards, SW SE SE Section 30-2-7, 531 bbls. in two hours through casing; and No. 15 Richards, NW SW SE Section 30-2-7, 1,022 bbls. in two hours through casing.

In the Altus Pool in Jackson County, Petroleum Products Co. has a 36-bbl. pumper from Granite Wash at 1,428-62 feet in its No. 2, SE SW SE Section 34-2n-20w. Manson and others' No. 1, NW NE NE Section 15-1n-20w, made 39 bbls. in 15 hours from Granite Wash at 1,410-43 feet.

Deep Rock Oil Co.'s No. 1, C NE SE NE Section 19-9-7, East Seminole Pool, was acidized in Hunton lime at 4,080-4,125 feet and produced 870 bbls. the first 16 hours and 372 bbls. the following 24 hours.

In the South Burbank Pool, Osage County, Enterprise Transit Co.'s No. 1, C NE SE NE Section 34-26-6, had Burbank sand pay at 2,835 feet and drilled to 2,849 feet, still in Burbank sand. The well flowed 1,614 bbls. in 12 hours and 3,082 bbls. in 24 hours. Same company's No. 1, SE SW NW Section 35-26-6, had sand at 2,854-2,919 feet, total depth 2,927 feet. It flowed 480 bbls. the first day and 511 bbls. the second, but after a 100-quart shot flowed 1,179 bbls. in 12 hours.

### NEW MEXICO

DENVER, Colo., June 11.—Ohio Oil Co.'s No. 3 State-McDonald, Section 16-22-36, 4 miles south of Eunice Pool, Lea County, New Mexico, came in flowing 248 bbls. an hour from pay at 3,785-3,815 feet with 400 pounds back pressure without acidizing, and for proration purposes was given an open flow potential of 12,000 bbls. daily.

## Elected Vice President

The board of directors of the National Bank of Tulsa have announced the election of Schell Harmon of Dallas, Texas, as vice president. Mr. Harmon, for several years has been an officer of the Harris Trust & Savings Bank of Chicago, handling its correspondent bank relationships throughout Oklahoma, Kansas, Texas, Arkansas, and Louisiana, and during the past 18 months has represented several large financial institutions in negotiating oil loans in the Mid-Continent Field.

SCHELL HARMON

# PIPE LINE CONSTRUCTION

FORT WORTH, Tex., June 10.—Lone Star Gas Co. has finally completed negotiations with Tide Water Oil Co. and Texas Seaboard Oil Co. and producers in the Cayuga Field, northwestern Anderson County, for a supply of gas from that field. The gas company will take up approximately 98 miles of 20-inch gas line in its Petrolia-Fort Worth trunk system and re-lay it from Irving Station just west of Dallas to the Cayuga Field and thence south to connect with its Long Lake-Waco 12-inch line laid last year, an 11-mile section from Reisel Station to Waco having been completed during the past week.

The 20-inch line will take gas from Tide Water Oil Co. and Texas Seaboard Oil Co.'s gas wells and a gas producer of Hunt Production Co., Inc., in the Long Lake Field, southwest Anderson County, and may tap the two gassers of Daniels Oil & Royalty Co. about 2½ miles south of Turlington in Freestone County. Gas will be taken ratably from wells in the Cayuga Field under a sliding scale price basis 20-year contract to comply with the State's recently adopted natural gas law which goes into effect October 1.

It will be a welded line and work is scheduled to be begun August 1, requiring about 3½ months. It will have a maximum daily capacity of 125,000 feet, and being connected to high potential gas producers in the Long Lake Field, where wells have a rock pressure of from 2,100 to 2,200 pounds, and wells in the Cayuga Field have a pressure of 1,500 pounds, it will insure Dallas and Fort Worth another large supply of sweet gas, having a high B.t.u. content.

The 74-mile 12-inch line from the Long Lake Field, southwest Anderson County, to Riesel Station in McLennan County, was completed in December. It has been carrying around 30,000,000 feet per day to cities and towns surrounding Waco. The extension to Waco supplied that city with an additional source. This part of the State had been obtaining gas through Lone Star lines from the Ranger or West Central Texas district. The company may later connect with four gas wells on the Buffalo structure between Centerville and Buffalo in Leon County. It has been negotiating with Shell Petroleum Corp. and associate owners of these wells for over a year, but nothing has been concluded.

Gulf Production Co., after negotiating with Atlantic Pipe Line Co. and Magnolia Pipe Line Co., has decided to lay its own connecting line to its No. 1 Goldsmith discovery on a 31-section block in Ector County, recently completed best looking well in the county. The line will be nearly 17 miles long, from its State-A Station in the Penn Field north to the discovery well. An old screw line is to be taken up between Wortham and Lufkin for this link.

## Marland Will Summon Meeting of Governors

Upon the suggestion of Governor Alfred M. Landon of Kansas, Governor E. W. Marland of Oklahoma will call a meeting of the governors of oil producing states at Oklahoma City probably next week to consider voluntary oil conservation until the interstate compact is ratified by Congress.

Governor Marland once more wired President Roosevelt urging congressional ratification of the compact already agreed upon by five oil producing states.

"Unless Congress ratifies the compact exactly as it was entered into by the states," Mr. Marland explained, "nothing can be done by the states toward organization of a commission or forwarding of plans for conservation until their legislatures meet again which would be, in most cases, in 1937."

Approval of a draft of a bill, to be presented in Congress, ratifying the oil states compact, was announced by Governor Marland.

Section 2 provides that "the President is authorized to suspend Section 1 of the act whenever he may find that the compacting states, by operations under said compact, are restricting the currently produced supply of petroleum to an amount less than the consumer demand therefor, or have in any other manner contravened the interests of the consuming public. During such period of suspension said compact shall be wholly inoperative."

## Revision of Code of Ethics Is Under Way

(Continued from Page 10)

The Wheeler-Rayburn utility holding company bill is expected to pass the Senate within a few days, due to some last minute amendments being inserted by Senator Wheeler. These amendments it is claimed do not relax in any particular the application of the law as to the abolishment of holding companies, but set up a broad definition of what is covered by the law, leaving to the Securities and Exchange Commission the promulgation of regulations and rules, and to whom they shall apply.

In the House this bill is still in committee, unofficial reports tending to show no progress is being made in whipping it into shape. The most recent report is that the committee is no nearer agreement than when it took the bill under advisement. It is rumored two members of the committee are holding up a favorable report, both members being of opinion the bill is unconstitutional and unnecessarily destructive. Both believe that by some sane method of regulation the same ends could be accomplished and bad features of some of the holding companies abolished.

## Confidence in Group 3 Gasoline Market Rising

(Continued from Page 24)

gravity distillates dropped down a notch, affected by much the same conditions. Unfavorable weather delaying agricultural operations has resulted in diminished demand for this group of oil products.

Although there was no pronounced activity in the lubricant group, there was a feeling that little better treatment by the weather man would bring a quick rise in this section of the market. As in the gasoline division, buyers are not disposed to fill their tanks until they know positively that the federal tax is to be continued. Wax was steady, with no change in quotations.

Importance is attached to the action of the Continental Oil Co. in its announcement to its sales organization of a policy calculated to increase stability of the retail market. The sales organization is directed to post normal and subnormal service station and tank wagon prices; to post station town, rural points and circuit points separately; to post dealer and tank wagon consumer discounts, and to post any dealer, noncancellable contract which allows any deviation from the regular posted dealer margin. Rules governing competition constituting in effect a code of ethics, are included.

### MAGNETIC STORMS

Tucson, Ariz., observatory of the U. S. Coast and Geodetic Survey reports a severe magnetic storm started at 12 o'clock midnight on June 7 and ended at 10 p.m. on June 11 (C.S.T.). The telegrams follow:

"Storm began seventh. Six. Severe."

"Storm ended eleventh. Four."

## Overproduction Reported Down in East Texas Field

(Continued from Page 16)

John Davis, of the Federal Tender Board, said the board was without authority to grant tenders on such oil under present regulations. The application is held pending decision at Washington.

The Railroad Commission instructed Harry A. Miles, chief engineer in charge of the East Texas Division, not to approve tenders on confiscated oil. Tenders are to be issued after the commissioners make check to ascertain that the sheriff has issued bill of sale and certificate of clearance on confiscated oil and products.

A suit brought by W. D. Lacy against the Railroad Commission for an injunction restraining interference with movement of 13,905 bbls. of oil alleged to have been reclaimed has been set for hearing before a three-judge federal court June 17.

At a hearing at Kilgore on the recovery by skimming plants, a Fort Worth refinery superintendent testified that the maximum gasoline recovery by such plants was 34 per cent when manufacturing 400 endpoint gasoline and 38 per cent when manufacturing 430 endpoint gasoline This testimony was adduced after Hemple distillation tests had been run on East Texas crude. The witness stated that possibly one or two East Texas plants would get the maximum recovery but it was impossible for the majority of skimming plants in the field.

Judge Meredith of the Gregg County special District Court on June 3 granted John E. Taylor, receiver for oil escaped from pits in the Gladewater area during rains, an injunction restraining the Railroad Commission from interfering with movement of that oil and issued a mandatory injunction instructing the commission to grant a tender on the salvaged oil. The East Texas Refining Co. of Longview is gathering the oil from top of the backwater and is paying for it on a graduated basis. An estimated 250,000 bbls. of such oil covered an area of around 40 acres. The commission previously refused tender on the oil.

Tank car shipments from the field for the week ending June 1 follow:

| | Cars | Gallons |
|---|---|---|
| Gasoline | 551 | 4,444,530 |
| Fuel oil | 190 | 1,780,100 |
| Casinghead gasoline | 154 | 1,301,220 |
| Distillate | 74 | 599,634 |
| Kerosene | 56 | 454,104 |
| Gas oil | 19 | 153,712 |
| Topped crude | 11 | 109,449 |
| Residuum | 7 | 56,947 |
| Naphtha | 9 | 73,191 |
| Total | 1,071 | |

This is a drop of 202 cars under last week. Only four cars went out without tenders (under court orders) this week. Runs to 21 plants operating in the field averaged 45,015 bbls. per day this week. Runs this week were nearly 2,900 bbls. per day under the previous week.

Overproduction is less than last week, when it was estimated at 31,000 bbls. daily.

Tank car shipments of petroleum and petroleum products from the East Texas Field during the three-month period, March 3, to June 2, 1935, inclusive, follow:

| | Cars | Bbls. (42's) |
|---|---|---|
| Gasoline | 6,720 | 1,298,337.72 |
| Fuel oil | 2,576 | 591,661.76 |
| Residuum | 249 | 52,513.31 |
| Distillate | 992 | 191,775.23 |
| Casinghead gasoline | 1,766 | 363,386.83 |
| Kerosene | 646 | 123,623.50 |
| Gas oil | 382 | 76,513.26 |
| Naphtha | 64 | 12,513.05 |
| Topped crude | 126 | 27,955.15 |
| Crude | 121 | 26,567.93 |
| Butane | 1 | 239.74 |
| Total | 13,643 | 2,764,473.11 |

NUMBER OF CARS SHIPPED

| | |
|---|---|
| Interstate | 6,201 |
| Intrastate | 3,813 |
| Intrastate—for coastwise movement | 3,629 |
| Total | 13,643 |

All cars shipped interstate were covered by Federal Tenders. All cars shipped intrastate, except 563, shipped under injunction, were covered by state tenders, and some of these by Federal Tenders also.

# A Simplified Explanation of Corrosion Resistant Alloys

By DR. T. HOLLAND NELSON

Stainless steels, or as they should be more appropriately called, "corrosion resistant alloys," are barely 20 years old. Almost 10 years of this period can be written out covering the World War and the fact that the necessary alloys were not available for this purpose; the remainder covers the experimental work and the practical tests coincident with any new developments. So that within a period of 10 or 12 years there have been created a multiplicity of alloys under the broad terms of "stainless" covering a wide range of chemical analyses and possessing a variety of physical and mechanical properties.

Probably no subject in the history of the iron and steel trade has received such concentrated study and investigation. The development of alloy steels, either partially or permanently resistant to corrosion, is far reaching indeed. They have revolutionized certain phases of the chemical industry making possible the replacement of glass and stoneware. They have eliminated hazards in many instances where the corrosion and deterioration of ordinary steels continually took place but could not be detected until failure occurred.

It would seem impossible that within a period of from 12 to 14 years a single subject, such as this, could become so complex.

### Alloys Strangely Similar

A glance at a recently published table of proprietary brands shows upwards of 400 different alloys by trade names listed as "stainless steels" of one type or another, yet they are all strangely similar, as I shall endeavor to show. Added to this the high pressure salesmanship and advertising of the present day, one can sympathize with the plant engineer called up to select a suitable alloy for the purpose of resisting some particular corrosive condition.

The understanding of a corrosion problem and the selection of the most suitable material for the purpose can be made a comparatively simple matter, if we use plain common sense and have some knowledge of the fundamentals governing the subject.

There are a variety of theories governing the phenomena of corrosion to be found in any suitable text book. I am not going to debate these theories, but I am going to say that we are all familiar with iron and steel rusting, and those of us who have examined many specimens are aware that there are different types of rust, or if we wish to say so "corrosion." Pure grades of iron will rust, but if this rust be knocked off underneath we shall find a comparatively smooth, clean surface, whereas steel of .30 or .40 per cent carbon will rust, but if the rust is removed we find a deeply pitted and etched surface.

### Simple Test

The author was associated with Harry Brearley, the inventor of the straight chrome (first named stainless steels), during his early work. Brearley is not only a genius as a metallurgist, but has the unique aptitude of explaining technical problems in the simplest of language. All of us, however, in the laboratory at that time were astounded when he asked for (1) a kettle of boiled water, (2) a test tube, (3) filter pulp paper, or cotton wool, and (4) a carpenter's bright nail—and said with this simple equipment he would explain why iron and steel rusted and the then "new stainless steel" did not.

He proceeded to place the nail in the test tube, covered same with previously boiled water, rammed in a pad of filter pulp paper and added more water, as seen in Figure 1.

The same was done with a piece of stainless steel and the two test tubes were placed with free access to the atmosphere and allowed to remain thus exposed for a number of days. It was then noted that a band of rust had begun to form in the center of the paper pulp band over the iron nail, yet the water both above and below it was perfectly clear and the nail still quite bright.

### Iron Dissolves in Boiled Water

The explanation of this is, in simple language, that the iron dissolves in the boiled water, and whilst the test tube stood exposed to the atmosphere excess oxygen was reabsorbed by the water in the upper half of the test tube and at a midway point in the paper pulp band, oxygen became available to the dissolved iron and we have it oxidising completely to rust ($Fe_2O_3$). The stainless steel showed no change at all.

The chemical explanation may be found in the following:

Iron goes into solution in pure water until the water becomes saturated with iron ions and a state of equilibrium is established. Until oxygen is admitted no precipitation of iron takes place. When the iron is dissolved by the water it first forms ferrous hydroxide, $Fe(OH)_2$, but due to its solubility it is not noticeable until a further reaction with oxygen takes place.

*Fig. 1*

$$2Fe(OH)_2 + H_2O = 2Fe(OH)_3$$

The ferric hydroxide, $Fe(OH)_3$, settles out of the solution as a reddish brown precipitate and gradually passes to hydrous ferric oxide, $Fe_2O_3$, which is commonly known as rust.

Pitting, or selective corrosion such as occurs in mild steels, is due first to the fact that, like iron, steel is soluble but due to its carbon content we have another condition present. Carbon exists in mild steel as carbide of iron, so that instead of having each crystal exactly similar to its neighbor, we have a mixture of iron and carbide of iron. This condition is more clearly understood if looked at with the aid of the microscope, as shown in the accompanying Figure 2.

When placed in a solution acting as an electrolyte, iron is destroyed by going into solution, whereas mild steel not only goes into solution, but is subject to electrolytic action between the black and white areas shown and is therefore subject to selective corrosion or pitting.

These two illustrations cover practically all the corrosion problems of today, i.e., they are either problems of metals going into solution, or of solubility aggravated by electrolytic action.

It is not my desire to clash with any accepted theory on corrosion, such, for instance, as the protective film theory. I have merely taken an author's license to explain in simple terms that if an alloy is rendered insoluble it is also resistant to corrosion under such conditions. It may well be that such alloys acquire a transparent oxide film which renders it insoluble. I leave my readers to take their choice of any particular theory of corrosion which they may prefer.

### What Constitutes a Stainless Steel or Corrosion Resistant Alloy?

Simply expressed we must render the iron or steel insoluble and immune to electrolytic action under the particular conditions we are called upon to combat. This should be very clearly understood. It is quite possible to render an alloy insoluble in one solution yet more readily soluble in another.

Brearley discovered that from 9 per

## Will Edit Metallurgical Department

**Tom Holland Nelson, D. Met., outstanding metallurgist and co-discoverer of stainless steel, has been retained by The Oil and Gas Journal as metallurgical editor. After preparing three special articles dealing with metallurgy, the first of which is published herewith, Dr. Nelson will assume charge of a metallurgical department in The Oil and Gas Journal. He will edit material submitted to this publication and will write articles calculated to aid the petroleum industry in the selection of the best type of equipment for particular needs and problems.**

DR. T. HOLLAND NELSON

**Dr. Nelson was born in Sheffield, England, and educated at Sheffield University in the Metallurgical Department. He commenced work with Thomas Firth & Sons, Ltd., Sheffield, in the melting department, forge and rolling mills, etc., and became assistant to Harry Brearley and, as assistant to Mr. Brearley, aided in the work which resulted in the discovery of stainless steel, this being at the Brown-Firth Research Laboratory at Sheffield. Joining Messrs. Darwin & Milner, Sheffield, Dr. Nelson rose to the position of works manager in charge of the company's five plants.**

**Dr. Nelson came to the United States and became steel works superintendent for Henry Disston & Sons at Philadelphia, remaining with them until the outbreak of the war in 1914. Dr. Nelson returned to England and joined the army. Later he became managing director of the Rotherham works of the firm of Peter Stubs. He returned to the United States in 1919 and rejoined Henry Disston & Sons as production manager and was placed in charge of all heat treatment and metallurgical research.**

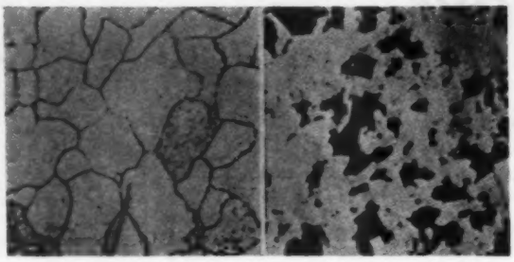
**Dr. Nelson started in the manufacturing business for himself in 1924 as T. H. Nelson & Co., making special alloy castings for the heat and corrosion resistant field. He later incorporated as Chrome Alloy Products, Inc., and in 1929 sold this company to the Midvale Steel Co. Since that time he has been acting as consulting metallurgist for a number of firms and maintains laboratories at Villanova, Pa., outside of Philadelphia.**

**Dr. Nelson is a member of the American Iron and Steel Institute, American Society for Testing Materials, American Society for Metals, American Institute of Mining and Metallurgical Engineers, the British Iron and Steel Institute and is vice chairman of the A-10 committee of the American Society of Metals and vice chairman of the Philadelphia Society of Metals. He has delivered more than 200 lectures on metallurgy before the British Iron and Steel Institute, the American Iron and Steel Institute and other societies in the United States.**

cent upwards of chromium added to mild steel and suitably heat treated rendered this first stainless steel "rustless" in water and damp atmospheres and resistant to many acid and alkaline solutions.

Here, therefore, we have the real discovery. Chrome, as a metal, is rustless and insoluble in water, and further when present in certain proportions in iron or steel it is capable of rendering the iron also insoluble, hence rustless and stainless in any solution in which it will remain insoluble. We will accept as a fact, therefore, that to produce a corrosion resistant or stainless alloy, we must have an insoluble material and of such a type and structure that electrolytic action will not occur within its own component parts.

*Fig. 2*



*Iron* *.30% Carbon steel*

Acid solutions have invariably been the means of testing rapidly the corrosion resistant properties of metals and it is interesting to note from the following table the behavior of a series of metals in solutions of the three major acids:

**SOLUBILITY OF METALS IN ACIDS**

(24 hours' immersion at 15° C. Weight of samples, 50g. The result is given in loss in weight per sq. cm. of surface.)

| Metal— | HCL conc. | $H_2SO_4$ 10% by vol. | $HNO_3$ Sp. gr. 1.20 50% by vol. |
|---|---|---|---|
| Iron | 0.0814 | 0.0327 | 0.7165 |
| Nickel | 0.0037 | 0.0002 | 0.1546 |
| Chromium | 0.2614 | 0.0014 | 0.0006 |
| Copper | 0 0018 | 0.0002 | 0.5708 |
| Cobalt | 0 6460 | 0.0150 | 0.4210 |
| Manganese | 1.1579 | 0.7724 | 0.5688 |
| Aluminum | 0.1071 | 0 0002 | 0.0010 |
| Silicon | 0 0002 | 0.0003 | 0.0002 |

W. H. Hatfield.

### Confer Properties Upon Iron

A glance at this list will show us very clearly some of the metals we would like to use for corrosion resistance if they had the physical properties, or were available in all the forms we required, but the point I wish to convey more particularly is that these particular metals, possessing as they do resistance in varied form may be able to confer, at least in some measure, this same property upon iron if alloyed with same; and this is exactly what has taken place in the development of corrosion resistant alloys. For instance, a glance at this table shows us clearly that chromium is much more resistant to nitric acid than it is to either hydrochloric or sulphuric; whereas in reverse nickel is much more resistant to sulphuric and hydrochloric acid than it is to nitric acid.

Now let us ask ourselves the question: Is it possible to obtain the advantages of nickel, or of chromium, or of silicon, so far as their corrosion resistant properties are concerned, if we add them to iron, or shall we say steels, for the purpose of obtaining two essential characteristics—that is to say physical properties which we might desire combined with corrosion resistance?

If I am successful in making clear my point, I think we may safely say that to a considerable extent we are able to do so.

Now let us take the intervening period, that is to say from the time of the discovery of these corrosion resistant alloys up to date, and looking at all the available data that has been published in the last 10 or 14 years, what do we find? In proprietary names we have upwards of 400 different types of corrosion and heat resistant alloys, but these can be broken down, strange as it may seem, to not more than four different groups, these hinging back again on the metal, or metals, being used by the steel maker to alloy with iron for the purpose of producing partial or complete corrosion resistance. We have, for instance:

### Four Basic Groups

1. A group of straight chrome steels.
2. A group of straight nickel steels.
3. A group of chrome steels in which nickel in various proportions is present in less proportions than the chrome present.
4. A group of nickel steels in which chrome in various proportions is present in less proportions than the nickel present.

You say at once that this is by no means the whole story, that you are familiar with such elements as silicon, molybdenum, copper, titanium, zirconium, selinium, cobalt, etc., and this is true—they are used in conjunction with any or all of the four groups, but usually for specific purposes, not always connected with corrosion resistance. Molybdenum, copper and silicon have proved themselves, however, to be definitely advantageous in the furthering of corrosion resistance, whereas the other elements are used discriminately for purposes that will be dealt with in succeeding articles.

It would perhaps be as well to refer to the high silicon cast irons, and also the recently developed alloys of iron-nickel-molybdenum, nickel-molybdenum-chromium-iron, and the nickel-silicon-copper-aluminum. The silicon irons are substantially resistant to the three major acids and many other complex corrosive solutions, as we can imagine from the behavior of the metal silicon. These alloys, however, are obtainable only in the cast form and are quite fragile. The latter alloys are substantially resistant to hydrochloric and sulphuric under certain conditions of temperature and this is substantially borne out by the behavior of the metals nickel, copper, silicon and aluminum referred to in the previously mentioned table.

From the foregoing it would seem logical to assume that if we wish to combat the corrosive action of a nitric acid solution we should choose a straight chrome material. If, on the other hand, hydrochloric or sulphuric acids were the problem, then we should turn to the nickel alloys.

Now a word with regard to the alloys in Groups Nos. 3 and 4: Can we add certain proportions of nickel to the chrome steels to obtain desired physical properties without detracting from their corrosion resistance, and vice versa, can we add chrome to the nickel steels for the same purpose?

The tables below will, I feel sure, convince the most skeptical that this is possible.

### Alloy Combinations

If our corrosion problems were merely those of simple solutions such as dealt with thus far, we should before this have been able to determine alloy combinations to offer either partial or complete resistance to same. Corrosion problems such as we are daily endeavoring to combat are extremely complex. Liquids below the earth's surface, for instance, may vary widely between alkalinity and acidity; such liquids may contain in solution, or suspension, material quite capable of accelerating or retarding corrosive attack. Assuming we could produce a seamless tube capable of withstanding the corrosive attack of any such liquid, it is quite possible that by contact with some particular strata corrosion may be very rapid from the outside. It may be that we could handle certain solutions at normal temperatures perfectly, to find that at a higher temperature rapid attack takes place. Often liquids can be dealt with, yet the vapors from same will set up attack. Throughout the process industries such complex solutions present real problems to the metallurgist.

The tendency in the past, however, to assume from the behavior of simple synthetic solutions that complex solutions containing similar proportions of what may have been deemed to be the corrosive element has been in many cases misleading. A few instances will suffice to illustrate this point. Dilute sulphuric acid will rapidly attack straight chrome stainless steel, yet acid mine water containing similar amounts of sulphuric acid in many cases do not attack this same material. Copper leaching solution, a dilute sulphuric acid containing copper, can be handled with 17/19 per cent chrome iron up to temperatures of about 160° F. Yet without the copper in solution the same material would be of no use whatever.

**TESTS WITH 5 PER CENT SULPHURIC ACID AT 110° F.**

| Straight chromium | | | Chromium-nickel | | | |
|---|---|---|---|---|---|---|
| Chromium per cent | Resd. iron per cent | Loss mg./cm.²/hr. | Chromium per cent | Nickel per cent | Resd. iron per cent | Loss mg./cm.²/hr. |
| 24.10 | 74 91 | 28.500 | 18.28 | 10.10 | 70.79 | .686 |
| 33.83 | 65.29 | 43.400 | 24.26 | 10.30 | 64.41 | .854* |
| 43.26 | 55.75 | 49 260 | 24.15 | 19.20 | 55 74 | .177 |

*Nickel in reverse ratio. Nickel, 24.40 per cent; chromium, 10.40 per cent; resd. iron, 64.01 per cent; loss, .078.

It is not meant to infer from the above that any of these analyses could be considered satisfactory for handling sulphuric acid solutions. It is, however, evident that chromium increases attack in proportion to its content, whereas the effect of nickel is immediately seen to retard solubility. Therefore, it is safe to assume that the best alloy obtainable will be one in which nickel predominates.

**TESTS WITH 5 PER CENT HYDROCHLORIC ACID AT 110° F.**

| Straight chromium | | | Chromium-nickel | | | |
|---|---|---|---|---|---|---|
| Chromium per cent | Resd. iron per cent | Loss mg./cm.²/hr. | Chromium per cent | Nickel per cent | Resd. iron per cent | Loss mg./cm.²/hr. |
| 24.10 | 74.91 | 27.425 | 18.28 | 10.10 | 70.79 | .775 |
| 33.83 | 65.29 | 54.360 | 24.26 | 10.30 | 64 41 | 11.180* |
| 43.26 | 55.75 | 161.800 | 24.15 | 19.20 | 55.74 | .717 |

*Nickel in reverse ratio. Nickel, 24.40 per cent; chromium, 10.40 per cent; resd. iron, 64.01 per cent; loss, .310.

It is not meant to infer from the above that any of these analyses could be considered satisfactory for handling hydrochloric acid solutions. It is, however, evident that chromium increases attack in proportion to its content, whereas the effect of nickel is immediately seen to retard solubility. Therefore, it is safe to assume that the best alloy obtainable will be one in which nickel predominates.

**TESTS WITH 5 PER CENT NITRIC ACID AT 110° F.**

| Straight chromium | | | Chromium-nickel | | | |
|---|---|---|---|---|---|---|
| Chromium per cent | Resd. iron per cent | Loss mg./cm.²/hr. | Chromium per cent | Nickel per cent | Resd. iron per cent | Loss mg./cm.²/hr. |
| 24.10 | 74.91 | .332 | 18.28 | 10.10 | 70 79 | .029 |
| 33.83 | 65.29 | .056 | 24.26 | 10.30 | 64.41 | nil* |
| 43.26 | 55.75 | .072 | 24.15 | 19.20 | 55.74 | .019 |

*Nickel in reverse ratio. Nickel, 24.40 per cent; chromium, 10.40 per cent; resd. iron, 64.01 per cent; loss, 5.930.

Showing clearly that for solutions of this type chromium should predominate.

The wider application of corrosion resistant alloys is assured, it can only take place with a more complete knowledge of the problems of industry. Whereas the steel works metallurgist has been striving for completely resistant alloys, we are now accepting and finding an economic use for materials possessing various degrees of resistance.

### Plant Metallurgist Important

In this direction, the establishing of metallurgical departments throughout the various industries has been of great assistance; the metallurgist in such a plant is far more familiar with his particular problem than the steel works metallurgist ever could be. He is able to test materials under actual working conditions and does not have to assume a result from synthetic laboratory tests. The results have already proved beneficial in many cases. The oil field metallurgists have already discovered the value of lower chromium steels, much lower than those originally suggested—yet which are just as effective from their point of view. In the various chemical industries many solutions, the composition of which it is not desirable to divulge, can only be intelligently approached by their own plant metallurgists.

There is also another, and very important, side to this very vexed problem, and that is the manufacture and production of the alloys themselves. Combinations of iron, chrome, nickel, molybdenum, copper, silicon, aluminum, cobalt, etc., can, in most cases, be obtained in the cast iron form. There are, however, many combinations of these metals which are not malleable and this fact restricts their application considerably.

In many cases we know of alloy combinations which are satisfactory for certain conditions, but due to the fact that they are not obtainable in the form required, we are not able to use them and in many cases have to accept some modification which is malleable and accept a partially resistant material only.

### Building Corrosion Resistant Alloys

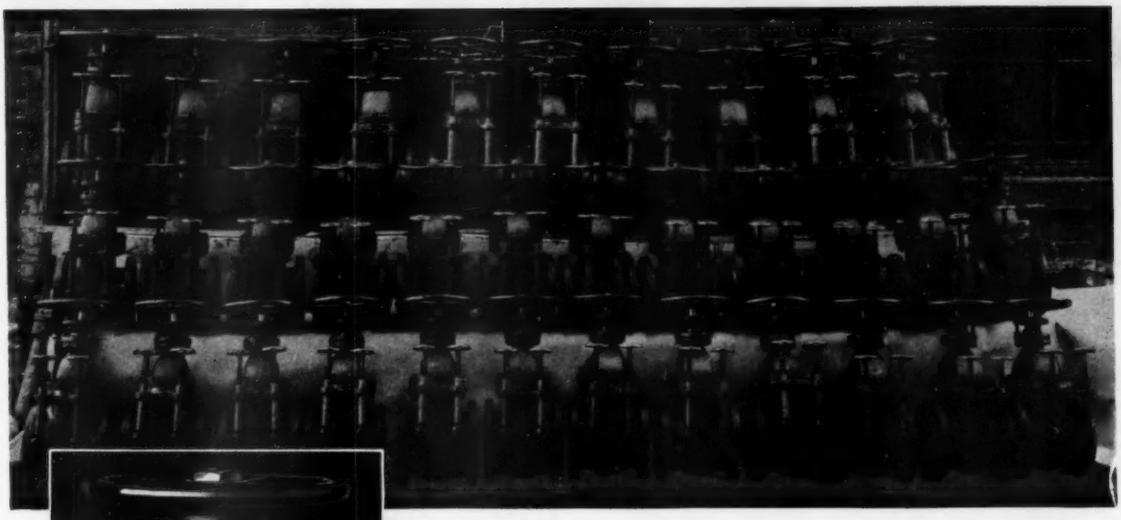
The object of this article has been to convey to those interested a knowledge as to how corrosion, or partially corrosion, resistant alloys may be built up, showing that their composition must obviously vary in relation to the particular corrosive media they are called upon to resist. The ideal material for any given purpose, of course, would be one that was completely resistant and obtainable in all forms, and possessing all the physical and mechanical properties desired.

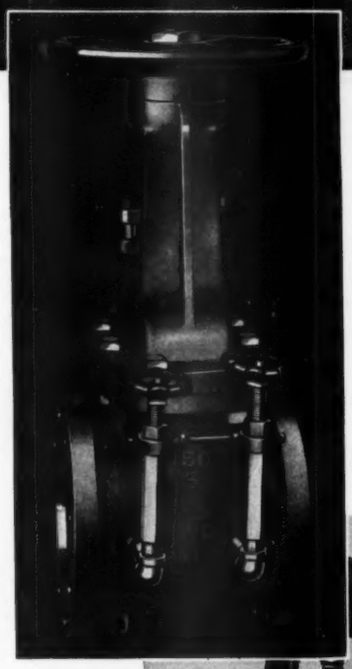
I feel that the desire to standardize, and to increase production has left us at the moment with a far too restricted range of alloys, and I believe time will see iron chrome and nickel alloys of varying ratios much in the order of the brasses and bronzes to be found in the nonferrous field.

I have not dealt with a specific type of material, nor any particular problem of corrosion; I have also used for the purpose of illustration thoughts previously expressed by me upon the lecture platform and elsewhere. My sole object has been to lay a foundation in simple language upon which we can build up and approach the materials we are using today and possibly may use tomorrow with a more complete knowledge of "what it is all about."

We have jumped from corrodible irons and steels and in 20 years have produced noncorrodible, or stainless irons and steels for some purposes. We are now engaged in putting the steps in the staircase, so to speak, and may expect to justify the use of many intermediate types which because of a price situation, and the fact that equipment does become obsolete are bound to have their economic value.

I have placed these corrosion resistant (so-called "stainless" materials) in four groups and I will endeavor to show in my next article how in a very simple, yet practical, way it is possible to speedily determine which group is most suitable for a specific purpose.





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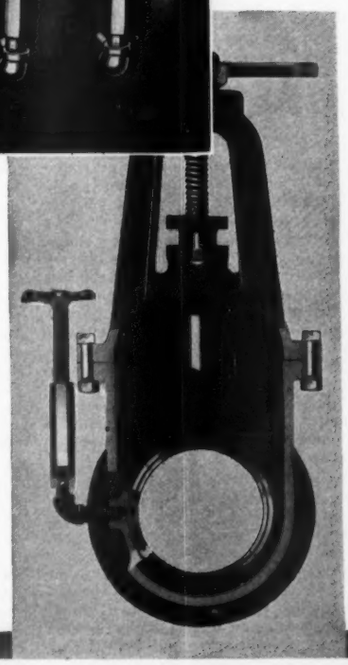

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# Corrosion, the Big Problem of Pipe Lines, Offers Field for Metallurgy

By ANDREW M. ROWLEY

The pipe line branch of the petroleum industry offers a fertile field for metallurgists in the solution of problems chiefly relating to corrosion. Much has been accomplished already but progress in combatting external corrosion of underground pipe lines has been made principally in the matter of protecting the pipe from such corrosion rather than in the use of metals or alloys of the pipe itself which would resist such corrosion.

Metallurgy has aided greatly in the development of present modern pipe line systems. It has been only a comparatively few years ago that pipe line systems were restricted as to length because it was not economically feasible to construct long lines because of the type of pipe then being used in pipe lines. Lap welded pipe had to be made of low carbon steel and high tensile strength was lacking. Trouble also was experienced in obtaining efficient, tight joints. A pipe line to transport large quantities of fluid or gas at the high pressures necessary for long distances would have had to have such thick walls the cost would have been prohibitive and construction especially costly.

### High Tensile Strength

With the development of electric welded pipe and seamless pipe, high tensile strength was obtained with thin pipe walls and it became possible to build long oil and natural gas pipe lines and transport large quantities of fluid or gas long distances at high pressures with safety and without excessive leakage losses. The development of proper types of welding rods was a most important factor in permitting the construction of long distance, high pressure lines. Metallurgists were responsible for the perfection of such types of rods for welding.

Corrosion is the big problem of the pipe line industry, whether the lines transport oil, gasoline or natural gas. The great bulk of this corrosion is external but there is considerable internal corrosion and corrosion of engines, valves and other fittings in pipe line stations. Gasoline lines are particularly susceptible to internal corrosion whenever water gets into the line.

External corrosion of underground pipe lines is due to numerous and varied causes. First there is the matter of corrosivity of soils. Study of soils has become a most important part of pipe line construction and operation during recent years with the U. S. Bureau of Standards under K. H. Logan, Dr. Gordon N. Scott, Dr. Scott Ewing and E. R. Shepard leading in the investigation of this question and the compilation of data to aid the pipe line industry and pipe and coating manufacturers to solve this big problem.

### Electrolysis

Electrolysis is another important cause of corrosion. Cathodic protection of pipe lines has been developed to a high degree of efficiency in combatting this cause of corrosion where electrolysis has been found to be the source of the trouble. Just recently one pipe line company developed a wind driven generator unit for use in areas not accessible to electric power lines (The Oil and Gas Journal, May 16, 1935, page 29).

But, as we stated above, while corrosion of underground pipe is the big problem of the pipe line industry, much of the effort to combat it has been directed along lines of protecting the pipe rather than in installing a different kind of material. Pipe line company executives believe this is the only way they can fight the problem because of limits to the amount of money they can pay for pipe. In other words, while they feel metallurgists can give them a pipe which will resist corrosion, the cost of such pipe at present would be prohibitive.

Metallurgy is and has been an important factor in solving other corrosion problems in pipe line construction and operation. And, that the field is still fertile for further operations may be visualized from the following list of problems enumerated by the president of one of the largest oil pipe line systems in the country. In answer to a question by The Oil and Gas Journal as to the problems which confront his company in the use of metals in connection with the construction and operation of pipe lines he said these problems are as follows:

"1. Metals able to withstand corrosion in gathering systems and salt water disposal lines.

"2. Protective coatings for the prevention of exterior corrosion of buried pipe lines.

"3. Protective coatings for the interior vapor space of storage and working tanks.

"4. Cylinder liners to withstand the corrosive action of low grade fuels in Diesel engines of pipe line stations.

"5. Metals to withstand corrosive action of low grade fuel oil in the fuel injector pumps for Diesel engines for pipe line stations.

"6. Metals to withstand corrosion in heat exchangers in the cooling systems of pipe line stations."

### Valves and Engine Parts

Some companies have used very hard steel for valves and valve seats in discharge pumps and surfaces have been coated with a hard alloy to minimize wear. Alloyed steels used in Diesel engines have permitted the speeding up of such engines and many engineers give metallurgy much credit for the present high speed possible in Diesel engines because of alloys used in parts subject to excessive wear. Metallurgy also encouraged the development of lighter Diesel engines, due to the perfection of lighter metals for pistons and other parts, thereby enlarging the scope of usefulness of this type of power.

Even a slight knowledge of metallurgy might aid in combatting some corrosion problems bothering pipe line men. As the engineer of one pipe line company says: "One thing that is continually overlooked by practical men is the relation of the electrochemical series to the service life of metals subjected to corrosive conditions. For example, it is customary to use lead gaskets under patch saddles and clamps in making temporary repairs of line leaks. In the electrochemical series lead is electronegative to iron so that the lead gasket stimulates the corrosion of the pipe that is being repaired. The same is true of bronze fittings in contact with steel pipe; the bronze being electronegative to the iron stimulates the corrosion of that metal."

This engineer further states: "It is important to obtain the best possible pipe for the particular purposes and conditions involved. Many companies send inspectors to the pipe mills to watch the rolling and drawing of the pipe that is to go in their lines. They reject all pipe showing bad irregularities by glow and color during the rolling and drawing.

"Another problem to consider has to do with the advances being made in the metallurgy of iron and steel, having in mind the resistance of those metals to underground corrosion. Some of the outstanding advances have been made in the development and use of corrosion resisting cast iron pipe suitable to withstand fairly high pressures.

"We have the ever-present problem of corrosion mitigation with respect to both stray current electrolysis and soil corrosion. Since corrosion is an electrochemical phenomenon, it is being fought mainly by electrolytic methods such as: Insulating coatings to be used only where necessary; insulating joints; bonding; discharge shields; outside casings; suspension bridges; laying pipe above ground in barren, desert territory; concrete; and cathodic protection.

"There is the problem of the design and use of scrapers, more particularly the brush scraper designed to remove sediment and products of corrosion from the line and the rubber disc scraper designed to remove water which causes internal corrosion."

From Pennsylvania comes the statement two additional problems being encountered there are corrosion of exhaust pipes from gas engines carrying away burned gases; and internal corrosion of line pipe and tubing in water flooding.

### Corrosion Big Problem

The manager of the pipe line department of a large pipe line company in California states corrosion is the one big problem confronting his company in the construction and operation of pipe lines. In California, he says, this means entirely external corrosion and includes the damage done by electroylsis and by long line currents as well as from ordinary forms of soil corrosion. He is interested in the questions of whether the carbon content of steel affects its tendency to corrode; whether a welded pipe has any more tendency to corrode than a seamless pipe; and whether any constituents of the steel can be changed to produce greater resistance to corrosion. (Note: It is entirely probable Doctor Nelson will discuss these problems when he takes charge of the Metallurgical Department of The Oil and Gas Journal. See announcement on page 33 of this issue.)

Problems being encountered by other pipe line companies are enumerated in the following statements made by executives and engineers of companies located in different sections of the country: "Our problems are economic rather than qualitative. The market affords a vast array of alloys physically suitable for practically every purpose but more often than not the price precludes the use in our work. For instance, consider the gray iron castings used in our pump plungers, which in severe service endure packing abrasion for about five years. No doubt the substitution of a steel properly alloyed with nickle and molybdenum would materially enhance the life of plungers but the price ratio is 1 : 3. Therefore, 15 years are required to attain an economic balance.

"The same general relation applies also to pump valves, engine exhaust valves, fuel pump plungers, liners, crankpins, and in fact most all moving parts of machinery subject to fatigue and abrasion. The reason is not manufacturing difficulties but is largely due to the cost of raw materials.

"Of course our principal concern is with pipe for subsurface use and our best interests will be served by the development of better materials for this purpose. Our major problem is means of mitigating corrosion. We believe the work toward the veneering of pipe with noncorrosive material is a step in the right direction and should be encouraged. In view of the research work now in progress along this line we feel confident that in the near future an economical process will be developed for veneering pipe which will be of inestimable worth to all pipe users."

### Another Company's View

"Our biggest problem is the protection of the pipe from corrosion and particularly the pitting of pipes. We have pipe lines that run through industrial districts and due to the different kinds of material in which the pipe lines are laid, and accentuated, we presume, by stray currents, we find that pit holes develop in the pipe very rapidly. Of late we have been packing our pipe lines in these areas in blue clay and find that it is a great protection.

"We are also faced with the heavy upkeep of pipe lines located in salt water areas on the coast."

### Fatigue of Metals

"In the actual use of metals we are confronted with only one serious problem, namely fatigue of metals, as shown by failure of highly stressed parts such as Diesel engine connecting rod crankpin bolts, and of certain engine and pump shafts. Since 1928 we have lost only one engine due to a crankpin bolt failure, and that was due to the bolt not having a fillet under the head, but we feel that we are treading on somewhat uncertain ground with regard to the bolts in service. On the question of shafts failing in service, our experience has been that the use of electric welding to give a surface covering on a worn shaft, so that a smooth surface can be remachined, either at the original or a larger diameter, is entirely unsafe. We have lost by failure in service several such welded shafts, and at the present time have ruled that welding cannot be used on shafts regardless of the small amount of metal that it is desired to deposit."

### Statement from California

A California pipe line company executive submits the following:

"The investigations of K. H. Logan, of the Bureau of Standards, indicate that the steels used for the making of pipe, no matter what their source, are equally subject to corrosion. No corrosion resistant alloy has so far been introduced on the market of a cost sufficiently low to justify its use for this purpose. It is, therefore, deemed necessary by the users of pipe material to determine the corrosiveness of the soil in which a pipe line is to be constructed and to decide on the basis of this soil survey the pipe protection which is to be used.

"The test of pipe coatings conducted for the American Petroleum Institute by Dr. Gordon N. Scott, of the Bureau of Standards, have clearly shown why pipe coatings fail or do not fail, and what constitutes the essential requirements of lasting pipe coatings. During the last few years several types of pipe coatings have been developed that promise to give good protection for a reasonable cost. Most of them use asphalts or coal tars, together with some reinforcing material either mixed with the matrix or applied

(Continued on Page 45)

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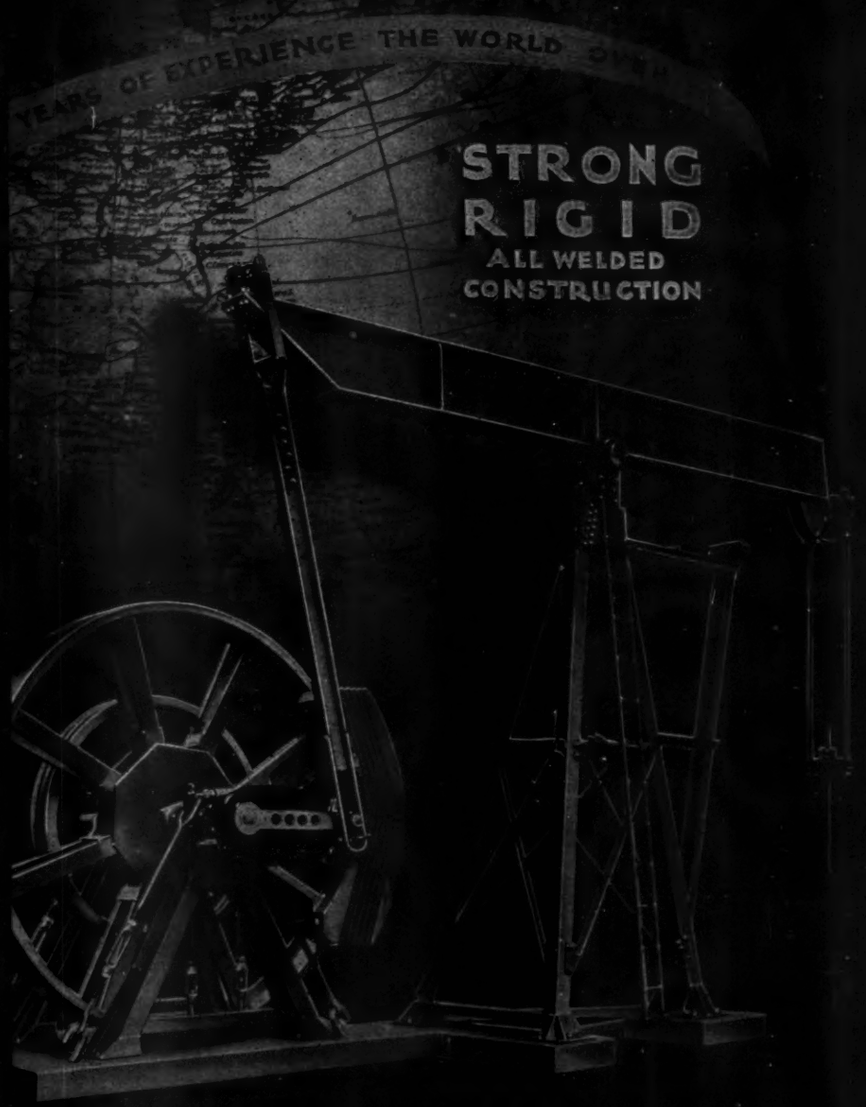


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# Problems in the Use of Metals in Drilling, Production and Storage

By L. G. E. BIGNELL
Petroleum Engineering Editor

In summarizing the most important problems in the use of metals in connection with drilling of wells and the production and storage of oils one well-known petroleum engineer has stated the following points as essential of consideration:

"1. Failure of drill pipe, drill collars, and tool joints by fatigue of metal and galling of threads.

"2. Unsatisfactory service obtained from drilling bits.

"3. Low efficiency of casing couplings.

"4. Failure of surface equipment used in drilling.

"5. Corrosion and sand cutting of screen and strainers.

"6. Corrosion and fatigue of sucker rods and tubing.

"7. Corrosion of storage tanks."

The petroleum industry recognizes the necessity for deeper drilling. This trend has been constant for many years but is accentuated now because geophysical exploration of undeveloped possible oil areas indicates the structures to be explored occur at depths below 6,000 feet. A few years ago occasional wells were drilled below this depth but in the Oklahoma City Field all wells are deeper than 6,000 feet and this is true in other fields.

Manufacturers are alive to the needs of the industry but when oil is at low prices the petroleum producers cannot afford to spend large sums of money for special equipment the manufacturer recommended. A compromise was effected and as a result the equipment used did not have the required margins of strength and when drillers made haste breakdowns were frequent and costly.

### Corrosion Problems

In the natural trend of development of oil field equipment iron and steel have played a most important part. This metal will deteriorate with varying degrees of rapidity when used under many oil field conditions. Sulphur compounds accompanying the oil constitute one of the most active corrosion elements and many metals have been tried to find one that will resist the attack of sulphur. Corrosion is a molecular phenomena and when two elements having a strong affinity for one another are placed in close proximity there usually follows a recombination of elements and where metal is concerned it is usually described as corrosive action.

Metallurgists can determine in advance the results to be expected by the use of any metal if all of the factors to be encountered in its use are outlined. With all factors known it becomes a metallurgical and chemical problem and science has progressed to the point where results can be stated in definite terms. The proper recommendation of a metal suitable to resist such combinations of elements is not always practical for the metal selected may be too costly or it may not suit other conditions to be met in using the equipment.

It is to find some happy medium where the available metals can be used with the greatest economic efficiency that is now occupying the attention of petroleum engineer and metallurgist. Some metals that can be used are slow to combine with sulphur compounds and while they will corrode to failure in time their useful life is sufficiently long to justify their use for equipment to handle crude oil that carries sulphur compounds.

### Drilling Problems

To quote from the comments of a petroleum engineer regarding some of the problems encountered in drilling holes for oil and gas, he says:

"In the process of deeper drilling, probably the most important problem encountered is proper material and design for tool joints and drill pipe. All tool joints and drill collars now in use are fabricated of alloy steel referred to as S.A.E. No. 3140. Although this material demonstrates marked superiority to plain carbon steel, a great amount of failure occurs from pin breaks, collar splits and thread galls. This type of failure is so common in drilling hard formations that it is impossible to operate at proper rotary speeds and sufficient weight on bottom necessary to obtain maximum drilling penetration.

"One fact noted in connection with pin breaks and collar splits is the tendency of this material to work-harden. Extensive failure of drill pipe occurs from thread-galls under ordinary drilling conditions, but in drilling hard formations many failures occur from breaks in the last engaged thread, apparently caused by stress fatigue resulting from the concentration of stress and fatigue at the point of change in cross section.

"Of second importance in drilling is the problem of material and design of bits. Deeper wells call for increased time for round trips, hence the importance of bit service increases with the depth of drilling. Water hardening chrome-moly-silicon-manganese steel is now being used for fishtail bits and meets the conditions of stress and fatigue placed on them; however, rapid wear from abrasive formations leaves much to be desired in the material and methods of hard facing.

"Another problem in the use of subsurface material is that of casing. For deep strings, A.P.I. Grade D material is being used. The material has generally met requirements in so far as strength is concerned but the undesirable feature is that the low joint efficiency of threaded couplings offsets the advantage of a higher grade of material. Very few failures have occurred upon initial setting, but it is mandatory to improve the design of casing couplings.

"Surface equipment presents several problems but not so difficult as those of subsurface equipment. Increased depths and speeds have correspondingly increased the demand on all hoisting and rotating equipment. All shafting is now of alloy steel and steel castings have been generally substituted for iron castings. Sprocket wheels and chains undergo both wear and breakage and require a material harder and at the same time more ductile than that now in use. Brake bands wear rapidly and at the same time score the brake wheel. The ball bearing and oil bath design in conjunction with material of rotaries is meeting the conditions imposed on them.

"Wire lines in use are of improved plow steel material. Although improved plow steel obtains higher safety limits in strength, it has sacrificed ductility of the softer steel and under ordinary conditions the lower grade of material gives longer service.

"Mud pumps encounter considerable failure of valves and liners from abrasion. The use of nitriding or other processes of surfacing has improved liners, and various improvements of material and design of valves have proved effective in extending their service period.

"Higher speeds and heavier loads created a demand for stronger shafts and moving parts of steam engines. Incorporation of oil bath lubrication has eliminated a large share of trouble from this equipment. As to steam pistons for pumps and engines, metallic packing has practically eliminated rod scoring.

"The trend toward pressures of 300 to 350 pounds of steam per square inch in oil field boilers demands improvement in the material for staybolts, rivets, flues and flue sheets, along with some changes in design. Higher steam pressures and temperatures require improvements in accessories such as regulators, valves and burners.

"Deeper drilling has likewise brought about problems in the production of oil. Increased pressures require well connections, valves and lines shall withstand excessively high pressures. Forged alloy steel valves and flanges and fittings are being generally used. Separators operating under high pressures demand material and design to withstand the high working pressures with safety. In addition, corrosion is a factor affecting pipe lines and separators in some areas.

"Deep drilling has increased the loads on pumping equipment. Material and design for prime movers and other surface equipment is being constantly revised. Shafting and gears are the source of more or less trouble. Beams, sampson posts and other parts present a problem of design rather than material. Abrasion and corrosion are detrimental factors in the operation of working barrels.

"Trouble from failure of sucker rods and tubing is the cause of considerable experimentation at present. The trouble is attributed to the combination of fatigue and corrosion. Galvanizing, upsetting of ends and full normalization have improved but not eliminated tubing problems. Sucker rods are receiving more attention and can be obtained in materials such as plain carbon steel, plain or alloyed irons and alloy steel.

"Oil well screen and strainer is a serious problem in the Coastal areas of Texas and Louisiana. A deposit of calcareous scale results in many work-over jobs. If scale is absent, the screen is liable to fail from a combination of sand cutting and corrosion. A number of alloys have been tested but there is still much room for improvement in this direction."

### Accomplishments

The foregoing quotation presents a general summary of the petroleum engineers' side of the problem. It is not to be assumed from this recital that deep wells are not being drilled and produced economically. But such ventures are always costly and it is good business to lower this cost as much as possible, also to so operate the property as to secure returns of the investment as quickly as possible.

It therefore follows that the petroleum engineer is looking to the metallurgist and manufacturer to provide him with metals and machinery that will accomplish his purpose more efficiently.

The fact that there are many holes drilled below 10,000 feet speaks well for accomplishments of the manufacturer and metallurgist. One well was drilled to 12,876 feet and recently secured complete recovery of 10 feet of core from the bottom of the hole. When it is possible to run a string of drill pipe to nearly 2½ miles depth and so manipulate a coring device as to recover nearly 100 per cent sample of the formation penetrated it indicates that with proper handling present day equipment is efficient.

The problems confronting the production division of the petroleum industry are largely those of application. Drillers have certain fixed ideas as to rotating speeds for bits that they have acquired by drilling shallower holes. Transferring such ideas to very deep holes does not always result in success of operation. These failures are not to be attributed to the metallurgist or manufacturer but rather to the fact that the driller has been required to proceed with the equipment at hand and it is frequently overloaded.

Further, it is often the case that the driller is inclined to try to hasten operations to hold down costs and therefore overloads equipment. In the early days of drilling 6,500-foot holes in Oklahoma City there were many failures of equipment because the operators were undertaking tasks that were new to them. Later such holes were drilled in less time and with fewer shutdowns because the operatives had learned their jobs and knew how to avoid trouble. There had been some improvement in equipment but not proportional to the reduction in failures of equipment after the drillers learned how to drill those deep holes properly.

### Metals Other Than Iron and Steel

All problems that have to do with metals used in the production department of the petroleum industry are not confined to the use of ferrous metals. Aluminum, copper, zinc, lead and other common metals have uses in various pieces of equipment.

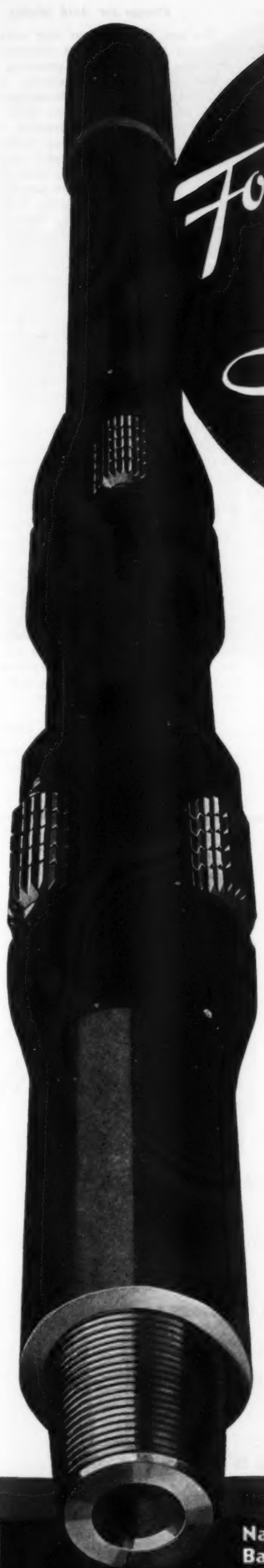
In working around places where natural gas is escaping and sparks caused by striking steel against some other material might ignite the gas it has been found much safer to use tools made of a special copper alloy. These tools have special application when an oil or gas well is out of control. If the well is on fire ordinary tools can be used because no further damage can be done, but after the fire has been put out it is quite important that every precaution be taken to keep it from relighting.

Hammers, wrenches, bars and many other small tools are made of hardened wrought beryllium copper that is hard enough to serve their purpose but will not strike sparks if they should slip or strike against the metal around the well head. These tools are formed and machined in a soft condition and then heat treated so they have great tensile strength and are tough and hard. This is not to be confused with the hardening of copper that is attributed to tools made by the ancients but is a modern metallurgical method of processing copper by adding from 2 to 2½ per cent beryllium to secure the desired degree of strength and hardness without making the metal brittle.

Aluminum is another metal that has found many uses in the production department of the petroleum industry. Sheets, bars and structural shapes are made of this metal and it is also formed into pipes and cast into vessels or small parts that have many uses around the lease.

Lease storage tanks made of aluminum

(Continued on Page 58)



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# Many Refinery Problems Must Now Be Solved by Use of Proper Metals

In submitting an answer to the question, "What metal problems do you have at your refinery" an executive of one major middle west refining company has offered a rather complete report of his experiences along metallurgy problems in eight different branches of the plant. The report is published here in its entirety as a part of The Oil and Gas Journal's desire to act as a medium of exchange of ideas and problems common to the petroleum and metal industries. The report follows.

### Pressure Still Furnace Tubes

In our pressure stills we use A.A.S.M. specification 100, 5" x 4" x 30', hot finished, seamless steel tubes. The number of tubes per furnace varies from 72 to 146.

Table 1 gives a brief summary of the service of the tubes in three of our refineries.

The procedure followed in an effort to lengthen the life of the tubes is as follows:

1. Improvement of firing conditions for an even distribution of heat in the furnace.
2. Regulation of hot gas recirculation for maximum heat with minimum flame in furnace.
3. Control of furnace combustion.
4. Lime treatment of charging stock when profitable.
5. Close inspection of furnace for coke deposits after cleaning tubes.
6. Minimum speed limit on hot oil pumps.

The exceptional record of tube service in our No. 1 refinery is probably due to a large extent to furnace design, although control of firing conditions, etc., as listed above, are important factors in tube service.

### Pressure Still Furnace Return Bends

We have in service carbon steel return bends of the box type, and 4 to 6 per cent chromium return bends of the streamline flow type. From a metal standpoint, carbon steel return bends have proven entirely satisfactory in service where the temperature does not exceed 850 to 900°F. When the operating temperature is greater than this, considerable distortion of the return bend parts and resulting leaks occur on carbon steel fittings.

For these excessive temperatures, it has been found advisable to use 4 to 6 per cent chromium return bends, or some alloy similar to this. The alloy bends which we have in service have proven entirely satisfactory, but the length of their service has not yet been sufficient to determine whether or not the additional cost is justified by corresponding increase in life and reduction in maintenance expense.

### Furnace Tube Sheets

There is a great deal of authoritative data on the various metals used at the many temperature levels found in refinery furnaces. Since all of these metals have a known temperature range where they give satisfactory service most economically, the choosing of the correct metal for tube sheets is merely a matter of judgment as to possible future service.

For our furnace tube sheets we use cast iron in low temperature areas, and heat resistant castings in high temperature areas. Both are very satisfactory in this service.

In the matter of cable for removing coke from pressure still units running to coke, we have found that we get much better service results when using an improved plow steel wire rope.

We have also, after a very thorough investigation, found that five-eighths inch cable was preferable to three-fourths inch cable economically. In some cases, the five-eighths inch cable was equal to the three-fourths inch in length of service.

After these factors are determined, the problem is clearly a matter of economical buying in conjunction with records showing the lowest cost per unit of service.

The following results were obtained in actual service with cable in coke units:

| Ref. No. | Cable/500 bbl. chamber-ft. | Runs per cable ⅝-inch | Runs per cable ⅝-inch |
|---|---|---|---|
| 1 | 3,600 | 30 6 | 24.6 |
| 2 | 3,600 | 29.7 | 28 6* |
| 3 | 3,600 | 32.4 | 33.3 |

* Estimated.

The following procedure is followed in an effort to prolong the cable life:

1. Control of the unit operation to insure a more even hardness in the coke throughout the chamber.
2. The cable is hung to eliminate, as far as possible, all kinks and twists, and to attain a direct tensile stress while pulling the cable from the coke bed.
3. Control in shutting down units to avoid movements in the coke bed.

### Pumps for Acid Sludge

We are disposing of our acid sludge by using it as a fuel. In connection with this was a problem of pumping against a 250 pound head economically. A rotary pump was used. After investigating, we developed, in conjunction with a well known rotating pump company, a pump with an exceptionally deep stuffing box, a Tempaloy "B" shaft and an entirely bronze surface in contact with the acid sludge. The packing which has been most effective is a loose, metallic, acid resistant material. The pumps operate quite satisfactorily under this service at the present time.

### Tube Bundles for Heaters, Exchangers and Condensers

The two classes of tubes most generally used for this service are steel and Admiralty. Steel tubes of course are the cheaper of the two, and we have found them to be the most satisfactory in exchanger installations where there is no water.

Admiralty tubes fully justify their additional cost, of approximately 25 per cent more than steel, in condenser and cooling installations where water is used as the cooling or condensing medium. The principal disadvantage of Admiralty tubes is that they are subject to considerable pitting when the water flowing through them contains particles which deposit on the sides and promote corrosive pits.

There are numerous other alloy tubes ranging in price and in lasting qualities between those of Admiralty and nickel steel. It has not been found desirable to conduct tests on these various alloys for the reason that the time required is so long that the alloys become out-dated before the test can be completed.

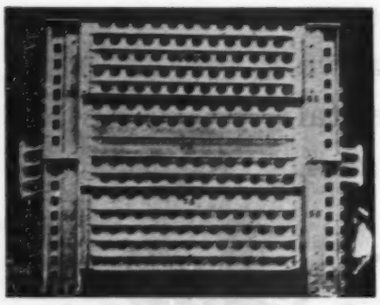
### Corrosion of Metal at Units

Corrosion is handled very satisfactorily in our plants by a lime injection into

(Continued on Page 62)

TABLE 1—SERVICE DATA ON CRACKING STILL TUBES

| Ref. No. | Average total thru-put each tube bbls. | Average firebox temp. °F. | Average life per tube est. yrs. | Treatment for red. of cor-rosion | Tube conv. bk. | Size rad. bk. | Type of crude |
|---|---|---|---|---|---|---|---|
| 1 | 45,000,000 | 1,400 | 7 | Lime | 5"x4"x30' | 4¾"x4"x30' | Oklahoma City |
| 2 | 3,650,000 | 1,500 | 2.8 | Lime | 5"x4"x30' | 5"x4"x30' | Healdton |
| 3 | 3,000,000 | 1,500 | 2.5 | None | 5"x4"x30' | 5"x4"x30' | Oklahoma City and Kansas |

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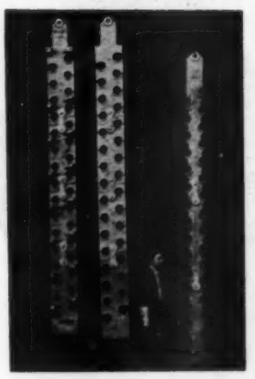


CALITE TUBE SUPPORT ASSEMBLY
FOR
UNIVERSAL OIL PRODUCTS CO.
EQUI-FLUX UNIT

Do not be mislead by the argument that chromium-nickel alloys may be arbitrarily grouped into classes which have "about the same physical properties."

High Temperature creep values depend on minor elements and manufacturing methods and apply only to the specific analysis tested.

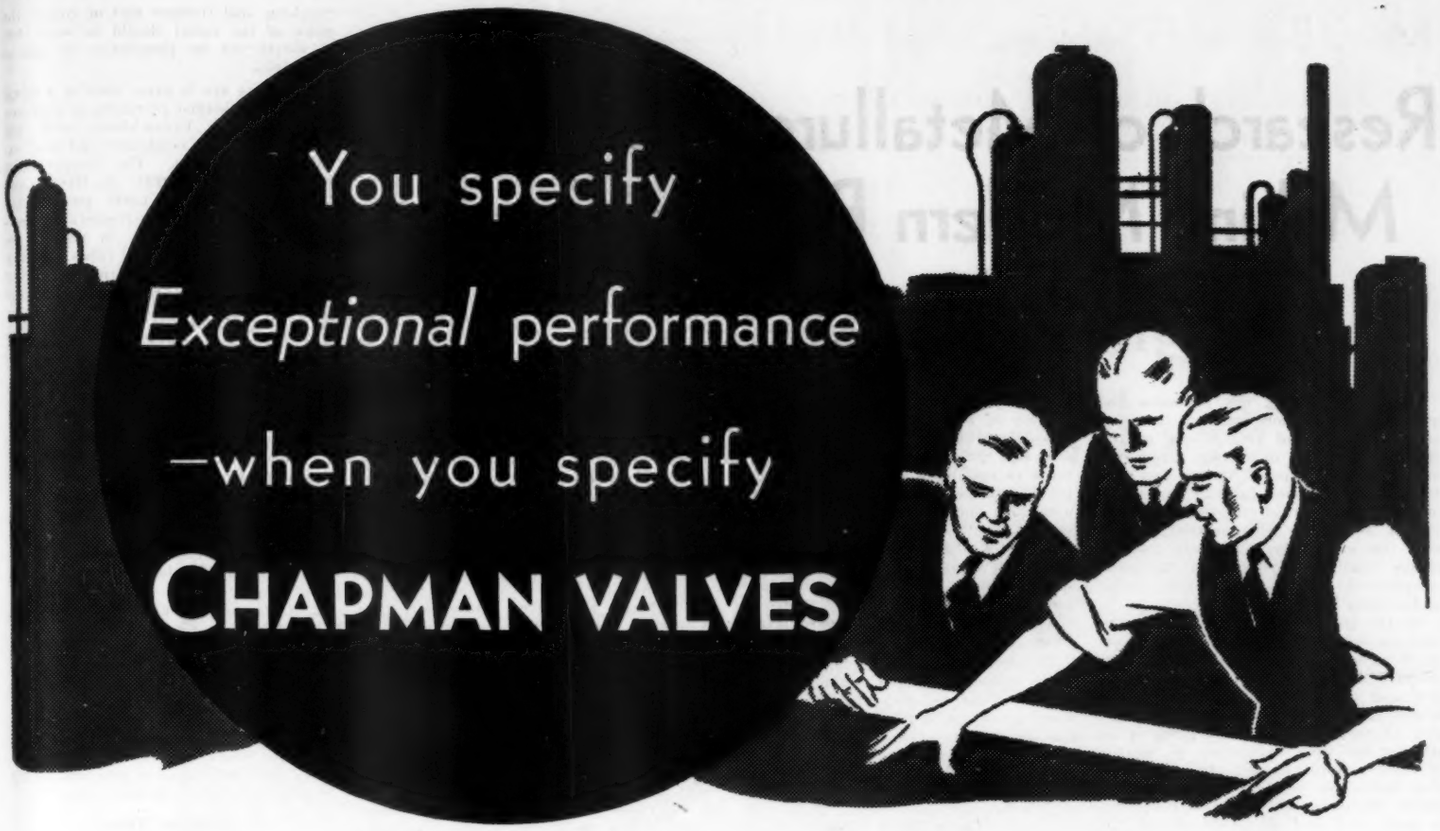
Creep values of tube support alloys of identical chromium and nickel content may vary 1700%.

ASK FOR BULLETIN

"THE DESIGN AND USE OF TUBE SUPPORTS IN CRACKING STILLS"

THE CALORIZING COMPANY

WILKINSBURG STATION PITTSBURGH, PA.

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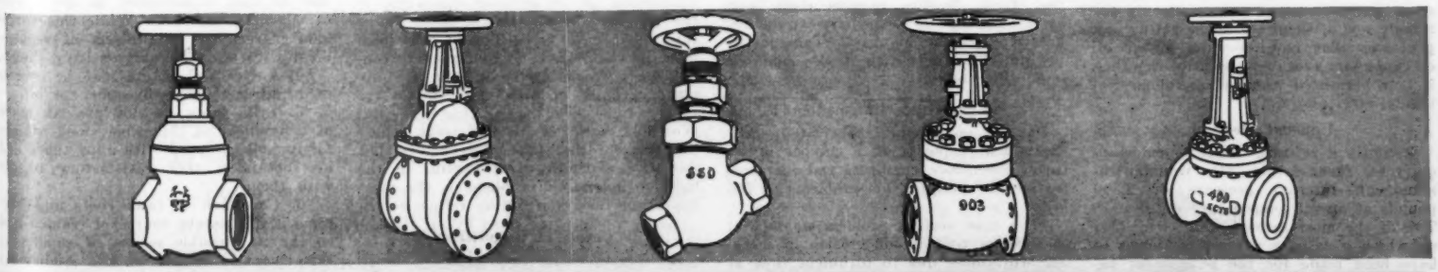


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Chapman Cast Steel Valves for pressures to 1500 lbs. and 1000°F.

Chapman Chrome Tungsten Steel Valves for corrosive service—pressures to 1500 lbs. and 1000°F.

# Research of Metallurgist Vital in Making Modern Refinery Possible

By W. T. ZIEGENHAIN

Petroleum refining has presented the metallurgist with more problems than any other industry and yet, is one of the largest consumers of metals. From the light-steel plate type of construction that went into refineries just 20 years ago to the massive forged and welded alloyed vessels used today the metallurgist has seen the art of refining pass from a simple distillation process to the most complicated, large scale manufacturing undertaking known today.

In the course of this transition the refinery technologist kept calling for metals of higher tensile strength, metals that would withstand more intense heat, abrasion and corrosion. In turn the metallurgist carried on research and has been able to supply them. Thus, progress in refining has been a function of the co-operative efforts of the two. Together, they have also seen the automotive industry develop as an important consumer of both steel and oil products and the problems of these three industries are being more intimately and frankly discussed for their mutual good than ever before.

### Joint Research

The triumvirate is spending more money for research than any other group of industries and the fact that automobiles could be designed to produce more power if the right kind of motor fuel was available and the refiner could economically make better motor fuels if better steels were available, makes it appear as though we may expect to see many important developments in all three fields over the next few years. Also, these three industries are coming out of the depression better fitted to meet new demands. Each has upon its drafting tables, plans for new units which call for the ultra-modern. The steel industry now has under construction furnaces and mills that will supply several new alloys, the automotive industry is ready to build engines of higher compression ratios than could be satisfactorily operated on gasolines now generally available and the refining industry is thinking in terms of 80 to 90 octane motor fuel as an economic possibility. Gas polymerization, dehydrogenation and hydrogenation promise to be the principle items which will call for work along these lines.

The great mass of refiners, however, is interested in special steels only as a means of cutting down replacement costs in conventional units and only relatively few of them are investigating new processes that require much higher oil or vapor temperatures and pressures than is now permitted when using commercial special steel alloys.

### Unusual Request

Recently a refining company made inquiry for furnace tubes that would withstand an internal pressure of 2,500 pounds at an oil temperature of 1500°F. This is the most severe set of conditions on which a definite request is known to have been made for the purpose of installing large scale equipment. The unit planned was to dehydrogenate natural gas and polymerize the atoms to make a superior anti-knock blending material.

### General Trend

While such problems are limited to a relatively few refining companies at the present, there is a distant trend toward the use of better steels generally. With price remaining as a factor in making demands, the refining industry will continue to call upon the steel industry to provide alloys of higher tensile strength with good ductility, alloys that will give service over a long period when used at abnormally high temperatures, provide steels which give high impact resistance, show improved creep values, meet good sub-zero impact ratings, resist corrosion and abrasion and show improved fatigue results.

The metallurgist in the average steel plant is constantly working toward this as a goal but to acquaint him with the direct problems of refiners, The Oil and Gas Journal has asked for the opinions along these lines of men actively engaged in refining and some of the statements are reproduced here, in part.

### Cover Broad Field

Before tabulating these replies however, it should be pointed out that the problems of the refiner will take the metallurgist into a broader range of operating conditions than any other branch of the oil business and that many of these problems are unique. For instance, in the manufacture of modern lubricants it is thought necessary to remove all wax from the oil. This is generally done by chilling the oil to low temperatures and in some instances these may go as low as –40°F. and in extreme cases –50°F. has been recorded. The embrittlement found in ordinary steel at these temperatures has made it necessary for special alloys to be developed and at the other end of the temperature range, we see refiners operating units in which the oil or vapor temperature is 1300°F. and at pressures up to 2,200 pounds. There are all sorts of intermediate temperature and pressure combinations in use combined with a variety of factors causing corrosion. It should also be stated that the problem of the metallurgist is not alone one of finding an alloy which will withstand certain conditions but he must see that the cost of the new metal is low enough to permit its use in large scale plant work when definite limits of unit manufacturing cost must be recognized from the standpoint of the refiner. As an example, there would be nothing gained in dehydrogenating and polymerizing natural gas for the production of a motor fuel if the finished gasoline costs more by reason of the expensive equipment needed than the motorists can justify paying compared with fuels made in some other manner.

### Condensed Statements

Passing on to the abbreviated statements and requests of a number of refinery executives, engineers and operators we see one outlying his problems as follows:

"The most serious problem we face at the present time is end erosion in cracking still tubes, due to turbulent flow at the return headers. We are considering the use of 18 inch alloy sleeves, but to date, we have taken no definite action."

Another refiner discusses the corrosion of distillation equipment as follows: "Our greatest problem at our refinery with regard to metal is to secure a satisfactory corrosion resisting metal at a reasonable price. The following services are where we are having the greatest difficulty:

"1. Bubble Cap Trays and Assembly Bolts in the Dephlegmator of the Cracking Units—At present, we are using cast iron trays and caps and class "C" bolts. The lower trays in particular corrode very rapidly, particularly at the nozzles, which we are now lining with a stainless steel liner.

"2. Heat Exchanger Tubes at the Cracking Units—These exchangers are on the overhead from the dephlegmator and at present consist of admiralty metal tubes. These tubes last about 90 days and then a large number of them must be replaced. We have used low carbon steel and also low zinc content brass tubes with indifferent success. We are planning on installing stainless steel tubes in several of these burners.

"3. Condenser Coils at the Cracking Unit—These coils are 2-inch standard steel tubing with welded return bends. The corrosion here is very spotty but necessitates almost continuous small replacements. The introduction of "aqua ammonia" is apparently helping this condition somewhat.

"4. The Naphtha Condenser at the Topping Unit—This condenser now consists of five-eighths inch admiralty metal tubes and is a continuous source of corrosion difficulties."

### General Situation

Considering the question of replacing refinery equipment generally, the following statement includes a vital thought as expressed by an executive of a large refining organization. "In my opinion, one of the major questions facing the refining end of the oil industry is the trend of operating costs on new equipment. Under certain conditions older equipment can be continued in operation when balancing increased operating cost of the old equipment against higher amortization on the new. However, as time passes, the owner of the latest equipment has benefits in yields and costs which are most advantageous in meeting strong competition. As a practical matter, if the amortization charges are earned, the owner of the new equipment is in a much better position than by spending the same amount of money for repairs on older equipment. From this point of view, I think that a very considerable proportion of the refining equipment in the United States is out of date. While this might mean a backlog of new business, it would have the unfortunate consequence of reducing the amount of equipment actually operated to handle the same volume of business. This is the unavoidable result of lowered costs. These things are rather trite and obvious, but the wise expenditure of capital in the light of individual problems is the most important task confronting refineries."

### Cheap in Quantities

Another executive finds need for cheaper special steels so these metals may be used in large quantities, he writes, "We are greatly in need of an alloy that will withstand temperatures up to 1,100 degrees Fahrenheit and pressures up to 1,000 pounds per square inch and not be subject to embrittlement. This metal would be used on fittings around the cracking still furnace and of course the price of the metal should be such that it would not be prohibitive to use in quantities.

"Also, we are in great need of a metal that will withstand corrosion of hydrogen sulphide gases, hydrochloric acid and chlorine gases in condenser and heat exchanger equipment. The temperatures would range from 600° to 100°F. and the pressure up to 1,000 pounds per square inch. In our low-temperature low-pressure equipment now in service, we are using Admiralty metal tubes and they have approximately twice the life of low carbon steel tubes. In our cracking furnaces, we are using four 6 per cent chrome, one-half of 1 per cent molydenum fittings and tubes with fairly good success at ordinary temperatures below 1,000°F. and pressures of 1,000 pounds or less per square inch."

### Pressure Still Tubes

Pressure still tubes present the most serious problems and again, the request comes for cheaper high-temperature alloys. The statement reads, "Our most important 'metal problems' at present are:

1. Selection of proper metal composition for the roof tubes in our high temperature pipe stills.

2. Corrosion of vapor separators and bubble towers on pipe still cracking units.

"The three developments in metal in which this company is most interested are (1) an inexpensive metal for high temperature high pressure service; (2) an inexpensive metal resistant to corrosion and erosion for the fabrication of exchanger shells and (3) an inexpensive metal resistant corrosion and erosion for the fabrication of exchanger tubes."

### Condenser Tubes

Condenser tubes are also sources of corrosion trouble and where brass is used dezincification has proved a serious problem. One executive writes as follows: "The outstanding corrosion problem facing this refinery is metals which will resist vapor corrosion and so-called dezincification from the water side of condenser tube."

### Summary of Refinery Problems

In more complete form another executive outlines his problems as follows:

"1. In the new type of cracking stills which we are using, we have discovered that corrosion in towers is much more severe than we had anticipated. We are forced to protect these towers either with a refractory lining, a metallic plating or by a complete metallic lining. At present we are working along all lines trying to determine which method is most advantageous. All of the schemes have been tried by ourselves or other companies but so far no standard method of corrosion protection for towers has been developed.

"2. Water corrosion on condensers and coolers presents serious difficulties in obtaining long life on this type of equipment. Various methods of combating this corrosion are being tried, including the use of special metals, treatment of water and control of water temperature and pressure.

"3. Piping valves and fittings for hot oil are subjected to severe corrosion similar to that experienced in the towers of our cracking stills. While this corrosion is serious, the problem of replacement with alloy is comparatively simple.

"4. Valves and fittings can be considered the same as piping for hot oil.

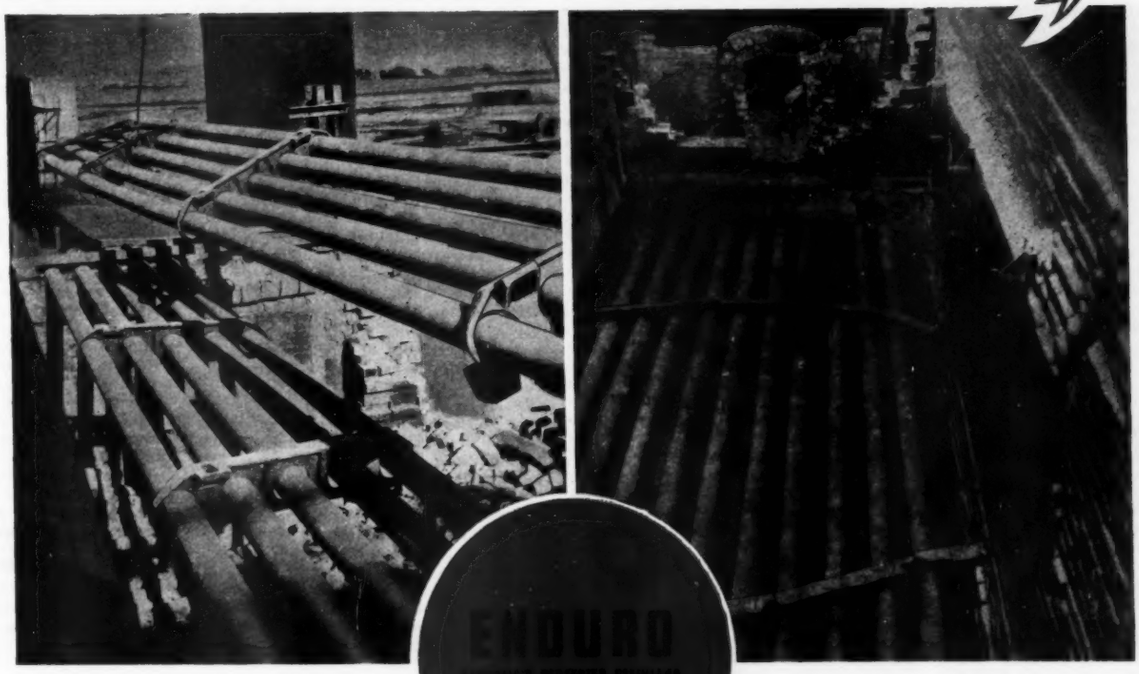
"5. Still tubes do not present much of a problem at this time since we are fairly well equipped with alloy tubes and are obtaining very satisfactory results with them.

"6. Corrosion of tank roofs and bottoms is a constant source of trouble and so far no suitable means of combating this corrosion is available. Additional thickness of original plates will lengthen the life of tank roofs and tank bottoms but does not assure indefinite life.

"In connection with these problems, we are also interested in the varying results which we obtain from equipment fabricated in different ways. The three

(Continued on Page 57)

# 40,000 hours of firing . . . then used again in a new still

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# Castings for High Temperature Service in the Petroleum Industry

By W. F. FURMAN
The Duraloy Co.

In common with other industries, changing processes and improved methods have brought the petroleum industry to the use of new materials, suitable for more rigorous service requirements. Satisfactory material must be found to stand up under constantly increasing temperatures in cracking processes and to resist the corrosive action of various acids and reagents in field and refinery.

So far as castings are concerned, these new demands have been met to a considerable extent by the use of alloy castings, particularly those containing chrome and/or nickel, with or without the addition of other alloying elements.

Much has been written regarding the properties and characteristics of such alloys but most of the information available has to do with materials subjected to working, such as rolling, forging or drawing. Castings present a special problem and the data developed for finished forms may have little or no bearing on their properties. Certain fundamental points of difference should be considered.

### The Matter of Analysis

The matter of analysis is one. The rolling mill is restricted to alloys which can be produced in fairly large tonnages while no such restriction applies to the foundry. This latitude for the foundryman should mean that cast iron forms are furnished of an alloy suited to the particular application but often this is not the case. The foundry is required to duplicate the analysis in which rolled products are available, even though some modification of it may promise longer life in service and be more desirable from the standpoint of foundry production. It must be understood that the first duty of a foundryman is to produce a sound product. Theoretical advantages of an analysis are lost if sound castings cannot be made from it. The quality of the castings is fully as important as the analysis for both high temperature use and corrosion resistance. An inferior casting, of a suitable analysis, will fail, while a sound, homogenous castings of a, perhaps theoretically, inferior analysis, may give much longer service life. Particularly where alloys are concerned, a slight change in analysis may result in material improvement in the quality of castings produced. Selecting the proper analysis for castings should be a separate problem and should not be entirely based on development work concerned primarily with other forms. A case in point is the alloy containing about 18 per cent chrome, 8 per cent nickel. Most foundrymen will admit that this is not a particularly desirable combination from the foundry standpoint. Better results are secured by increasing slightly the percentage of both chrome and nickel, particularly the former. Metallurgically, such a change is advantageous, as corrosion resistance is somewhat increased, the higher chrome contents make possible a higher percentage of carbon and, most important, it results, as a rule, in sounder castings. But foundries are frequently restricted to the lower analysis range because it is more or less standard with the manufacturers of rolled products.

Castings differ fundamentally from rolled forms because there is no working of the grains after casting. Sometimes slight changes in the grain structure can be effected by heat treatment but for high alloy steels generally, it remains as in the as-cast condition. The development of correct foundry practice is, therefore, extremely important. Pouring temperature, rate of cooling and similar factors have a pronounced effect on grain structure, particularly grain size, in alloy castings. It is important to keep this in mind, as it helps to explain the all too frequent lack of uniformity in castings of the same analysis, produced in different foundries. To meet this condition, users are issuing specifications, which embody not only chemical analyses but various tests, which are expected to determine whether the proper foundry technique has been followed. Unfortunately, it is difficult to devise tests for castings which will be more than indicative. To determine physical properties, it is customary to pour test bars in the heat in which the casting is produced. Such bars are poured under the most ideal conditions, with everything possible done to insure satisfactory grain structure and homogeniety. The wall section of such bars is uniform and the response to heat treatment much surer than in the case of the ordinary casting with its uneven metal sections and of a size or shape, perhaps, which does not lend itself to quenching. Figures secured from such test bars have only a theoretical bearing on the commercial castings produced in the same heat. These may be of such design that interior shrink strains or apertures exist, there may be gas pockets and similar defects, and difference in rate of cooling and sometimes also in pouring temperatures may have caused a grain structure which will vary considerably from that of the test bar.

### Testing Methods

When service conditions are severe enough to justify the extra expense, it is possible to overcome this difficulty to some extent. If a number of similar castings are being made in the same heat, a few can be set aside and tested to destruction. Physical properties can be determined from bars cut from the casting, samples etched and examined for grain structure and chemical determinations taken in different sections to make sure of an even distribution of alloying elements.

Usually such testing methods are too costly and the user has to rely on the experience and good intention of the foundry. I should like to emphasize here that more than a melting furnace and a molding floor are required to make fine quality alloy castings. It is a job for a specialty foundry, which is willing to give each separate operation careful, intelligent attention. The problems of such a foundry are far different from those of the foundry making ordinary iron or steel castings. Because there is so much which is intangible about an alloy casting, because of the importance of correct foundry practice and the difficulty of determining by any practical test that the full potentialities of the analysis have been realized, the user of alloy castings should make sure that he is getting them from a source which has the necessary equipment, experience and intelligence to produce them in a satisfactory way. There are a number of foundries which meet these requirements, but the list does not begin to include all those claiming to be producers.

During the past 10 or 12 years, the petroleum industry has absorbed a considerable tonnage of alloy castings for high temperature use, consisting mostly of tube supports, beams, hangers, etc., in oil cracking stills. Such parts must maintain considerable loads for indefinite periods at fairly high temperatures, without undue sagging or distortion; they must be resistant to oxidation at high temperatures and in many instances must be fairly immune to the corroding action of sulphur gases.

Exactly what temperatures are involved is somewhat uncertain. The actual metal temperature of the casting is required and this can only be secured by the use of recording pyrometers, with the thermo-couple attached to the casting. The matter has not seemed important enough to justify such care and the determination of metal temperatures has been, to some extent, guesswork. It is probably that they are actually considerably lower than has been assumed. From all information available, it seems safe to say that in most stills the supports do not reach a temperature above about 1,600° F. and that applications involving actual metal temperatures much above this figure are few and far between. Results shown in service by various alloys bear out this assumption. Alloys have given satisfactory service which have not generally been successful in applications where temperatures are more accurately measured at temperatures higher than 1,400° to 1,500° F. The fact that oil still temperatures are fairly constant, without sudden fluctuation, simplifies the application.

### Strength and Temperatures

The first question usually asked of the producer of alloy castings is "What is the strength of the alloy you are recommending at high temperatures?" If the producer is absolutely honest he will reply "I do not know." This does not mean that the producer cannot answer this question in a way which will be sufficient for practical purposes; it does mean that he cannot furnish exact information based on tests and data which are entirely convincing to a careful engineer or metallurgist.

It has been assumed by many that such exact information can best be secured by means of long time creep tests. The technique of creep tests is extremely complicated, the procedure now being covered by specifications issued by the joint committee of the A.S.T.M. and A.S.M.E.

The element of possible error in such tests, particularly at temperatures over 1,600° F., is high. The difficulty of accurate measurement and precise temperature control at these high temperatures is obvious and yet, as F. B. Foley, superintendent of research for the Midvale Steel Co., expresses it, "Creep values are very low and change very rapidly with temperature. Small temperature fluctuations produce large variations in creep values and the creep values being quite low, there is a large percentage of error." I realized that there is considerable difference of opinion among metallurgists as to the accuracy of creep tests at these elevated temperatures and yet to a layman who has had considerable experience with the behavior of metals at high temperatures, the possibility of excessive error in such tests is great.

Even granting that the actual test can be conducted in such a way that the element of possible error is reduced to a minimum, what can be determined from a test? Only that a certain test specimen, of a certain analysis, will show an elongation of so much at such a temperature, for such a period, under the application of a certain force. When an attempt is made to build on this foundation, it will be found that it will not support much weight.

In the first place, specimens for the test are selected with care and will have a more uniform grain structure and be more free from defects than the average commercial castings.

No allowance is ordinarily made for loss of defective cross sectional area from scaling, carburization or other causes. Creep test results are expressed usually in terms of 1 per cent creep in 10,000 or 100,000 hours, with most of the tests run for only 500 to 1,000 hours. The long time figures are assumed from the short time tests. Such an assumption is not justified and is often contrary to the facts. Results in a short time creep test can be considerably improved by the addition of certain elements, the effect of which, over longer periods, may be much less satisfactory. To be specific, both carbon and tungsten additions will increase the physical strength of the standard chrome-nickel alloys at elevated temperatures, if results are determined by a quick pull test or a creep test run for only a few hundred hours. Their effect is less noticeable if the test is prolonged and may even be a disadvantage.

This means that the alloy which makes the best showing in a 500 or 1,000 hour creep test will not necessarily carry the heaviest load in service.

### Safe Load Figures

While recognizing that creep tests have considerable indicative value, most producers of alloy tube supports prefer to base safe load figures on information secured from actual installations. These figures are vulnerable to scientific scrutiny but they have been checked and rechecked against actual installations and have stood the test of having apparatus designed from them placed in service with successful results.

It is interesting to note that safe load figures worked out independently by several producers, are reasonably close. Four manufacturers of an alloy containing 24-26 per cent chrome, 10-12 per cent nickel have submitted safe load figures, at several temperatures, to the author. Figures were developed by each producer from his own individual experience. Expressed in pounds per square inch they are as follows:

| | Deg. F. | | | |
|---|---|---|---|---|
| | 1,500 | 1,600 | 1,800 | 2,000 |
| Producer A ..... | 2,750 | 1,700 | 500 | 125 |
| Producer B ..... | 970 | 650 | 250 | 90 |
| Producer C ..... | 3,000 | 1,700 | 800 | 100 |
| Producer D ..... | 3,000 | 1,700 | 350 | 100 |
| Average ..... | 2,430 | 1,440 | 475 | 100 |

An average of these figures would probably be acceptable to most producers of this particular alloy and could be used by the designing engineer. Considerably higher figures, based on creep tests have been circulated for alloys which, in actual service over a period of years, will compare unfavorably with the 25 per cent chrome, 12 per cent nickel alloy mentioned. I would not say, however, that the figures given above are too conservative. In fact, if exceptionally long service life is expected with the certainty that actual metal temperatures will equal the assumed temperatures, with other factors, such as loss of cross sectional area through scaling more than ordinar-

ily effective, some factor of safety might be used, even with these comparatively low values.

There is real need for intelligent research work in this field. Tests which will duplicate actual working conditions, using commercially available alloys and run for prolonged periods, are necessary. Carefully managed field tests would be especially valuable and should result in information more reliable than anything now available.

Resistance to oxidation is not the important factor as almost any of the standard alloys which have been made into tube supports will be satisfactory in this respect. Unless the nickel content is high (say over 25 to 30 per cent) the percentage of chrome present should be over 20 per cent for best results. In the writer's opinion, it is wise to maintain a chrome minimum of about 24 per cent to insure satisfactory oxidation resistance. This establishes a slight margin of safety which would be beneficial in case of accidental overheating.

There is always the possibility that the products of combustion in oil cracking furnaces will run fairly high in sulphur. It is generally known that nickel is susceptible to sulphur attack. For such installations it is advisable not to run the nickel over 12 to 13 per cent and some increase in the chrome content is also helpful. A combination of about 28 per cent chrome with 10 to 12 per cent nickel usually works out well for this condition.

### Sulphur Conditions

During the past 10 or 12 years tube supports have been made from a great many different alloys. The percentage of failure in service has been low, indicating that the problem is to select the alloy from this number which will be most economical, based on heat hour cost.

For temperatures from 1,600° to 1,800° F. there is substantial agreement among producers as to the alloy which will best meet this requirement, particularly for low sulphur conditions. This would be somewhere between 23 and 26 per cent chrome, with enough nickel added to give strength and toughness. It is important to select a combination of chrome and nickel which will result so far as possible in a stable austenitic alloy. The standard composition of 10 to 12 per cent nickel with 24 to 26 per cent chromium meets this requirement. The leading producers of tube supports were asked to submit their recommendations, as to the proper alloys for this service at various temperatures. Five supplied this information and their replies are given below as a matter of interest:

**LOW SULPHUR CONDITIONS**

| | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cr. | Ni. | Cr. | Ni. | Cr. | Ni. | Cr. | Ni. | Cr. | Ni. |
| Over 1,800° F. | 35 | 15 | 28 | 12 | 24 or 35N. | 12 15C. | 24 | 12 | 35 Cr. | 15 Ni. |
| 1,600°-1,800° F. | 35 | 15 | 25 | 10 | 24 | 12 | 24 | 12 | 24 | 12 |
| 1,500°-1,600° F. | 30 | 10 | 18 | 10 | 24 | 12 | 24 | 12 | 24 | 12 |

**HIGH SULPHUR CONDITIONS**

| | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cr. | Ni. | Cr. | Ni. | Cr. | Ni. | Cr. | Ni. | Cr. | Ni. |
| Over 1,800° F. | 28 | 10 | 28 | 12 | 28 | 10 | 24 | 12 | 26 | 12 |
| 1,600°-1,800° F. | 24 | 10 | 25 | 10 | 28 | 10 | 24 | 12 | 24 | 12 |
| 1,500°-1,600° F. | 18 | 8 | 18 | 8 | 28 | 10 | 24 | 12 | 24 | 12 |

With chrome fixed at from 24-28 per cent and nickel from 10 to 12 per cent, the effect of other elements should be considered.

Carbon, manganese and silicon are always present and tungsten, molybdenum, titanium, selenium and columbium are sometimes added, singly, or in combination. Manganese is present usually in small quantities, not sufficient to produce the brittle range, so it can be disregarded. Better ductility will be secured if the silicon is low but there are conditions under which a silicon content over 1 per cent is an advantage.

There is a difference of opinion as to the amount of carbon which should be present in this type of alloy. Probably the majority favor fairly low carbons, with .30 to .40 as the upper limit, others recommend a carbon content around .50 to .60, while there is at least one producer who advocates a carbon over 1 per cent.

From the standpoint of production costs, high carbons are a decided advantage. The price of ferro-chrome decreases as the carbon content of the ferro-chrome increases. Ferro-chrome with .20 carbon costs about twice as much as a ferro-chrome with 4 to 6 per cent carbon. Melting costs can be further reduced by the use of miscellaneous high carbon scrap, whereas the producer working to low carbon limits uses scrap, if at all, cautiously and in small quantities. An increase in carbon increases the fluidity of the molten metal. As these alloys should be poured on the cold side, any increase in fluidity is advantageous and insures a high yield of good castings. It can be seen that the producer who recommends low carbons is not acting from selfish motives except in that it is to his advantage in the long run to supply the best possible grade of castings regardless of cost. It has not been possible generally to get a higher price for the low carbon castings so there must be convincing reasons for their use.

### Resistance to Corrosion

It is generally known that resistance to corrosion increases as carbon decreases. With products of combustion varying in composition, increased resistance to corrosion is an advantage. Where chrome-nickels are concerned, the possibility of intergranular corrosion must also be considered. The higher the carbon the greater the chance for carbide precipitation and eventually some form of intergranular corrosion which may cause failure. Perhaps the most important argument in favor of low carbon is that the higher carbon alloys are more brittle and tend to crack in service. A confirmation of this came under the writer's personal observation.

Tube supports made of an alloy of 24 per cent chrome, 12 per cent nickel with .80 per cent carbon, failed fairly soon in service because of cracking. Under exactly the same conditions supports from the same producer, of the same design and the same analysis except that carbon was about .35 per cent are still in good condition after a longer service life than the high carbon supports gave. A considerable tonnage of supports containing over 1 per cent carbon recently failed in service because of excessive brittleness and cracking and are being replaced with supports made of a low carbon alloy.

It is claimed that increasing the carbon increases the strength of chrome-nickel castings at high temperatures. This claim has been substantiated to some extent by comparative results secured from quick pull tests and short time creep tests (creep tests running from 500 to 1,000 hours are considered to be short time creep tests). There are not sufficient definite data available to determine with certainty the lasting effect of high carbons on strength at high temperatures.

Tests indicate that the beneficial effect of high carbon does not last and that a chrome-nickel casting containing say 1 per cent carbon would have less strength after prolonged exposure to high temperature than one containing says .50 to .60 per cent carbon, even though its initial strength were greater. These tests are by no means conclusive. I do not know of any authoritative work which has been done along these lines. The matter is not really important, as the objections to high carbons already mentioned place a very definite limit on the use of such castings.

In speaking of high carbons, carbons over .60 or .70 per cent are meant. How far below about .60 per cent carbon it is necessary to go is also a matter of dispute. Some producers maintain an average carbon about .50 per cent while others keep carbons below .40 per cent or even .30 per cent. As stated above, failure from cracking does not ordinarily develop unless carbon is above about .60 per cent, other factors being equal. For most applications, the writer would prefer an upper carbon limit, not more than .40 per cent but producers working to slightly higher limits, say up to .60 per cent, have some justification for their position. There is hardly enough definite information available to warrant a final decision at this time.

What has been written so far has had to do with fairly high temperatures. Below 1,500° F. there seems to be a temperature range which sometimes produces embrittlement in the chrome-nickel alloys.

For this range care should be taken to insure a correct proportion of chrome, nickel and carbon and the effect of high carbon is particularly bad. This alone would be a valid reason for maintaining a low carbon content, as operating temperatures may easily come within this range for fairly long periods, even though the average temperatures are higher.

### Addition of Other Elements

Tungsten, in small amounts, usually 2 to 4 per cent, has been used as an additional alloying element in 24 per cent chrome, 12 per cent nickel tube supports. There is no doubt that such an addition results in considerable improvement in the initial high temperature strength of such an alloy. Its effect over long periods of exposure to high temperatures is much less certain. The concensus of opinion now among investigators is that the beneficial effects of tungsten are lost after a few thousand hours' service. This is particularly true as temperatures increase. It seems to have a more lasting effect if operating temperatures are under 1,600° F. As tungsten is an expensive alloy, it hardly seems worth while to use it under these conditions.

The same comment can be made of molybdenum additions. This element has a decided value when added to the chrome-nickel alloys, particularly in the 18-8 range, when resistance to corrosion is the important requirement. However, its value for high temperature work is most uncertain. Castings have been known to disintegrate at fairly high temperatures, due to loss of molybdenum through sublimation.

Other elements, such as titanium, selenium and columbium, import various valuable properties to alloys used in the corrosion resistance fields but are not ordinarily required for applications such as tube supports.

An exception might be made in the case of titanium, the addition of which in small quantities is claimed to be beneficial in the embrittling range already mentioned.

Most of the alloy castings used in the petroleum industry under high temperature conditions have been in the form of supports, beams, hangers, etc., for stills. Some refineries have used cast alloy soot blower tubes in topping stills, with considerable success. Most of them also use alloy pyrometer tubes and wells. Usually alloys running on the high nickel side are recommended for this service but tubes of an alloy containing 30 per cent chromium, no nickel, have given satisfactory results in installations where sulphur conditions are bad.

Several foundries are now casting tubular forms by the centrifugal process. The advantage of castings made by this method over static castings is obvious. A much denser, finer grain is secured, walls are uniform, strength is increased, the inside diameter is concentric with the outside, and gas pockets, interior shrinks and other defects are eliminated. For at least one cracking process centrifugally cast tubes have been used successfully. They were of an analysis particularly suited to meet somewhat special conditions in which drawn tubing could not be furnished. There is no thought that such tubes will find general use in oil cracking stills to replace drawn tubes. The fact that they can be furnished in any analysis suitable for casting, without piercing or tonnage limitations, makes their use possible for special applications and may allow process developments which otherwise could not proceed.

From the metallurgical standpoint, there is still need for considerable research work in this field. New alloys more satisfactory from the standpoint of service life or cost may easily be developed and beneficial modifications of the alloys now being used may be worked out. The volume of potential business for alloy castings in the petroleum industry should be sufficient incentive for such metallurgical research by the producers of these castings.

## Corrosion, the Big Problem of Pipe Lines

(Continued from Page 36)

spirally between layers of the hot matrix. The tendency today is to bury the pipe bare in noncorrosive or mildly corrosive soil, and to protect it heavily in corrosive soil. Painting or a single application of asphalt or coal tar is considered of no value. In a noncorrosive or mildly corrosive soil experience might indicate that a pipe line after many years of service will merely be coated with a slight layer of rust, no pits having developed. This experience does not necessarily indicate that a second unprotected pipe line laid parallel to and a short distance from an old pipe line will do equally well. Experience rather indicates that under these condtions, where one pipe line is coated with rust and one is bare, a current will begin to flow from the bare pipe to the rusty pipe, possibly resulting in pits in the course of a few years. If such current is found to exist, particularly when the soil is moist, it is advisable to bond the two pipes by means of copper wires at frequent intervals, thus eliminating the pitting of a new line.

"Cathodic protection has been resorted to in a number of instances where old pipe coatings develop holes and where electrolytic action was set up. Cathodic protection would not be justified on bare lines.

"Doctor Scott's work has also been valuable through his determination of the characteristic trend of pitting of buried unprotected steel pipes. The pitting trend indicates that the rate of increase of the depth of the pit decreases with time, so that in slightly or moderately corrosive soils a pipe wall of moderate thickness will probably not pit through for many years. This trend is shown in the curves on page 136 of American Petroleum Institute Protection Bulletin No. 212, November, 1933. These curves applied with a safety factor could be used to determine the advisability of using lighter weight pipe in the low pressure portions of a line.

"During the last few years our company has used Grade B pipe, as specified by the American Petroleum Institute, having a tensile strength of 60,000 to 70,000 pounds per square inch. A reduction in weight is possible through the use of this pipe over Grade A pipe, which has a tensile strength of 48,000 pounds per square inch."

### ROYAL DUTCH TANKERS

SAN PEDRO, Calif., June 10.—The magnitude of Royal Dutch-Shell Oil Co.'s recently launched tanker replacement program was revealed when two more brand new Shell motor tankers were simultaneously in port on maiden visits. Shell will have 40 new oil carriers; 24 under the Anglo-Saxon house flag and 16 under colors of the Eagle Oil & Shipping Co., Ltd.

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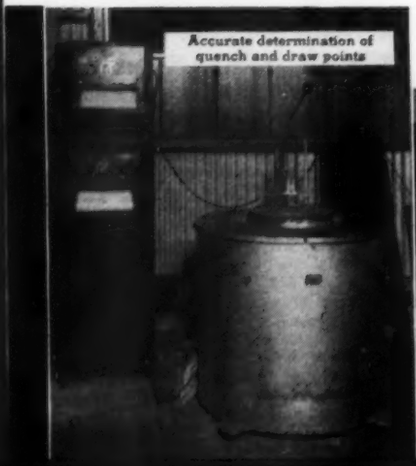
Through indomitable perseverance in research, the right steel specifications and heat treatment was accomplished. The result was the greatest contribution to the development of rock bits since they were first introduced. And improvement never stops.

## ANOTHER PIONEERING STEP WAS THE MAKING OF REED REAMERS

. . . . with a forged alloy steel, heat treated body with connections forged integral. A battery of the most modern, electrically operated, automatically controlled, double chambered, continuous heat treating furnaces is used.



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Elastic limit—ultimate strength—reduction of area—bend

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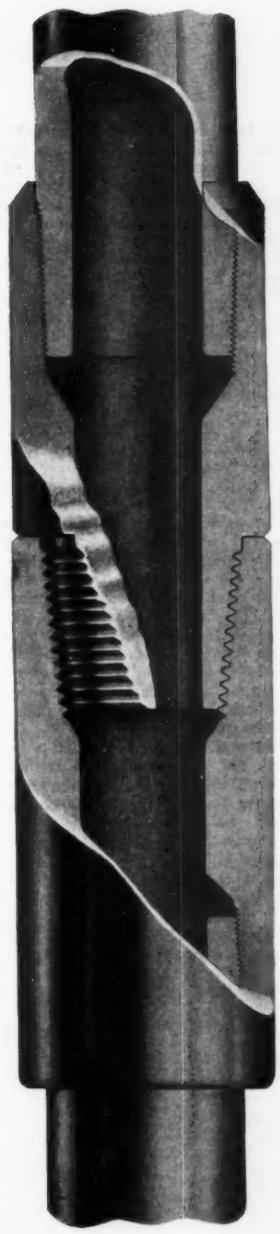
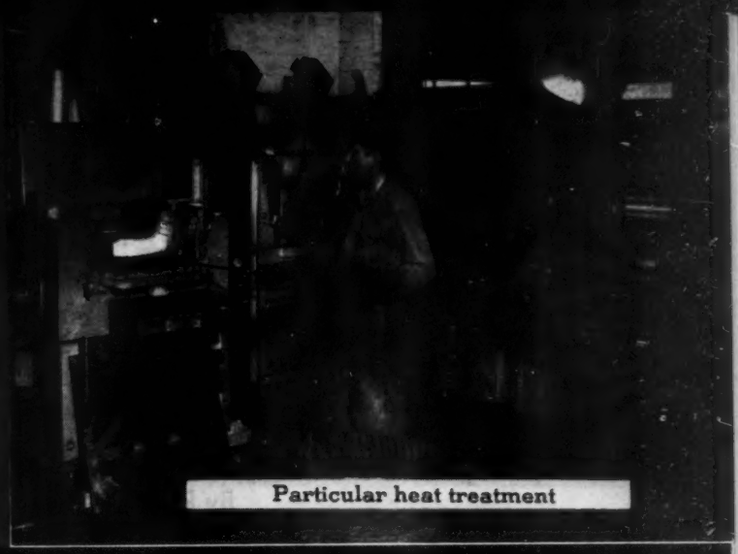
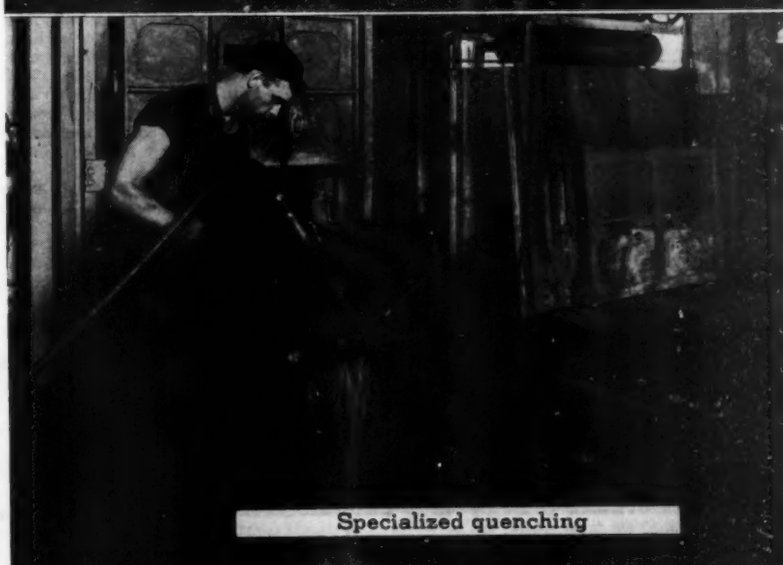


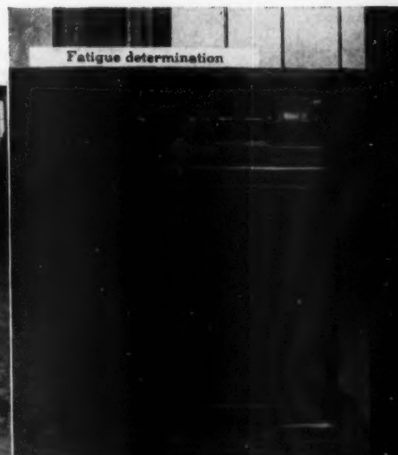


Particular heat treatment

Controlled heat treatment

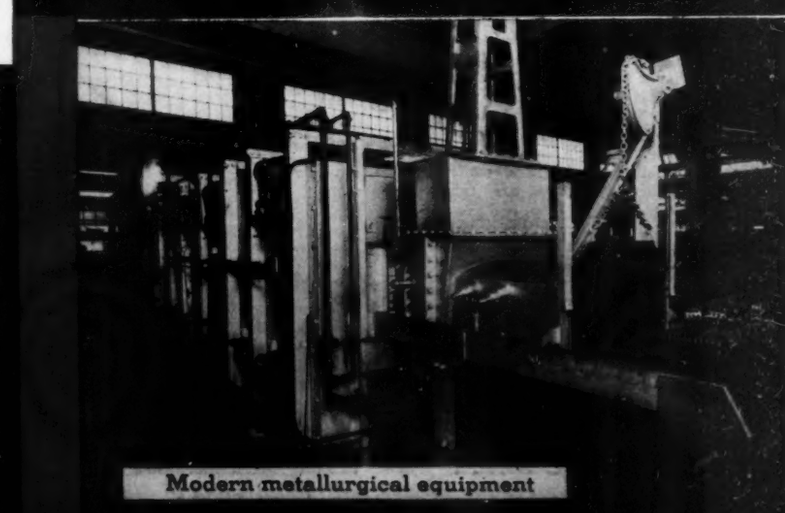


Specialized quenching



Fatigue determination

pact value insurance



Modern metallurgical equipment

# Metals Used in Construction of Heat Exchangers

By R. C. POWELL
Chief Engineer, Refining Department, Texas Co.

The most important metals used in the construction of heat exchanger equipment for oil refinery services has been and is steel and cast iron.

While there have been many improvements in the design and adaptation of refinery heat exchangers, there has been no known economically priced metal or alloy developed and manufactured commercially which has sufficient ductility to avoid the effect of embrittlements caused by expansion, contraction, and opposing stresses which are due to temperature changes, and at the same time have the physical properties to resist the several types of corrosion commonly encountered in the process of refining the crude from one or more sources.

There are, however, a large number of metals and alloys, some of which are satisfactory under certain limited conditions in the ranges of pressure, temperature and acidity, others satisfactorily resist certain definite types of corrosion and possess at the same time such physical properties as to make them suitable for some particular part of an exchanger.

### Variety of Conditions

In the selection of metals for exchangers, it must be realized that the pressures and temperatures, as also the more important types of corrosion encountered in refining processes are numerous and vary widely from each other, even on a single unit or battery of stills.

Metal parts in the assembly of present day exchangers consist of shells, stationary head, stationary head cover, floating heat, floating head cover, shell cover, spacer and clamp rings, channels, tube sheets, tubes and baffles. Since each of the several parts or group of parts must resist certain forces which tend to fatigue the metal either by stresses or the effects of corrosion, it is necessary to consider pressures, temperatures, nature of oils and other process conditions in order to make a selection of the proper metals for the exchanger parts.

In classifying the principal forces and the resistance necessary in the metals used in the construction of the parts concerned with each condition, the metals named are those that have been used over a reasonable span of time in actual operating conditions. It must be remembered that the selection of proper materials for exchanger service is a difficult problem and that additional costs must be justified at least by correspondingly increased life of the equipment.

A division of exchanger parts may be made under two general heads:

1. (a) Those parts normally subjected to pressure and temperature from product on one side only, and having free parallel expansion and contraction stresses where products are relatively noncorrosive.

(b) Those subjected to a different pressure and temperature on each side, causing opposite stresses of expansion and contraction and where products are relatively noncorrosive.

2. (a) Those subjected to pressure and temperature conditions as in (1a) above and in addition the products handled have certain definite types of corrosive elements.

(b) Those subjected to pressures and temperatures as outlined in (1b) above and in addition the products handled have one or more definite types of corrosive elements.

### Metals Used

Parts in division 1a may include exchanger shells, head covers, spacer and clamp rings, etc. Firebox quality carbon steel is used in more than 90 per cent of new installations, the shells being rolled and welded, with flanges of the same material.

Parts in division 1b may include tubes, tube sheets, stationary head, floating head and cover, channels and baffles. Here the material problem is again simple, but costs of fabrication and stability enter into the picture; carbon steel of a ductile quality would be satisfactory for each part; however, the tube sheets must be hard enough to withstand tube rolling with a minimum expansion. Tubes of seamless steel have shown service records of five to six years, beyond which it would be difficult to justify longer tube life at an increased first cost. Stationary heads of both welded carbon steel and of cast iron have proven satisfactory.

Parts in division 2a, the shells and head covers only can be classified as having parallel expansion. The proper metals to use is becoming a question, but we can surmount this one owing to the fact that heat transfer rates are not a vital factor in the design of the shells and head covers; we are allowed to include in the thickness of the shell and covers a certain allowance for corrosion so that for most refinery purposes cast iron or rolled welded carbon steel have so far proven the most economical.

Parts in division 2b, named in the order of their importance are again the tubes, tube sheets, stationary head, floating head and cover, channels and baffles. The best that can be accomplished here is to select the metal best suited for any one or several conditions. To say that any particular metal will give satisfactory service in the presence of any certain corrosive compound at a fixed condition of pressure and temperature would be missing the mark by a wide margin, for the reason that exchanger operating conditions with respect to corrosion change with the kind and age of crude, the stage of the run and many other factors not within our control in a commercial plant. However, when by experience we eliminate all parts that have rarely been the cause of shutting down a unit, we find that we are mostly concerned with the tubes and tube sheets. Heads and channels are available in a variety of corrosion resisting alloys such as chrome nickel cast iron, chrome nickel cast steel, stainless steel, monel and aluminum.

Baffle materials are available in many alloys and so long as they are not of a material which is particularly susceptible to corrosion by some certain compound known to be present in the products, they will in most cases outlast the tube material used. The reason for this is that while the baffles are exposed to only one of the mediums through the exchanger, the medium is at different temperatures on each side of the baffle, this setting up opposing stresses which tend to advance the corrosion rate.

Baffles are generally available in the same material as used for the tubes, though it is seldom necessary to use an alloy baffle in order to balance the tube life.

Tube sheets are subjected to more stresses and are more susceptible to corrosion than any other part of an exchanger but since they are not considered as a part of the exchanger surface and they must be thick enough to afford sufficient grip to hold the rolled tube securely and also must be hard and thick enough to avoid distortion by tube rolling, we have by design requirements developed a tube sheet that will give a longer service life than the tubes whatever the condition. It follows then that the tube sheet composition should closely approximate that of the tubes, so that when we have selected the tube material we have limited the tube sheet material to that particular family of metals or alloys.

### Exchanger Tubes

Tube metals are the most important and the most variable in composition, in life, in fact from any standpoint.

We would call those tubes good, whose uniform composition and adaptability to a certain duty was such that their life could be forecast within a reasonable time period. The value of operating time lost due to premature shutdowns, each caused by the failure of a few tubes in a bundle, is far more than the total cost of the original tube bundles.

In classifying tube metals it is advisable to qualify all remarks by a division of the types of tube failures into three principal groups as follows:

A. Water corrosion.
   1. Dezincification (in brass only).
   2. Localized water pitting of stainless steel (18-8).

B. Vapor or oil corrosion.
   1. Acid corrosion.
   2. Sulphide corrosion.

C. Mechanical failures.
   1. Radial cracking.
   2. Erosion.

The following table gives the average tube life in months for three-fourths inch 16 ga. tubes taken from many installations, grouped according to the above classifications.

In selecting tubes for heat exchangers, each metal or alloy will be found to have some particular advantage and disadvantage so that a compromise must be made to arrive at the most economical solution, based on the cost of tubes and length of service.

In general refinery service, tubes in low temperature service are chiefly concerned with such agents as hydrochloric acid (HCL) as are encountered in salt-bearing crudes and hydrogen sulphide ($H_2S$) in solution.

Steel and cast iron are rapidly corroded by both while copper and Admiralty metal are resistant to the former while 18-8 stainless steel and chrome nickel irons are more resistant to the latter.

The injection of neutralizing agents such as lime, caustic and ammonia into refinery equipment for the purpose of controlling corrosion has been tried with some success. Their use is dependent upon the cost of application and whether they will have any injurious effects upon the oil products.

The effects of various corrosive agents at high temperatures appears to be somewhat questionable at times, but sulphur and its compounds in the presence of iron at high temperatures form iron sulphide, and this reaction is very active above 700° F. Stainless steel and aluminum are good resistors of this type of corrosion.

**A. UNDER 250° F.**

Service—Sweet Naphtha to Water

| | | | |
|---|---|---|---|
| Plain steel | 9 mo. | 18-8 | 41 mo. |
| Admiralty | 20 mo. | 18-8 | 20 mo. |
| Muntz metal | 35 mo. | 18-8 | 33 mo. |

**A. OVER 250° F.**

| | | | |
|---|---|---|---|
| Plain steel | 4 mo. | 18-8 | 14 mo. |
| Admiralty | 17 mo. | Ambrac | 14 mo. |
| Brass | 16 mo. | Alcunic | 14 mo. |

**B. UNDER 215° F.**

Service

| Gasoline to Water | | Gas Oil to Water | |
|---|---|---|---|
| Plain steel | 11 mo | | |
| 18-8 | 13 mo. | 18-8 | 19 mo. |
| Admiralty | 20 mo. | Admiralty | 25 mo. |

Service—Sour Naphtha to Crude

| | | | |
|---|---|---|---|
| Plain steel | 7 mo. | Admiralty | 24 mo. |

**B. OVER 215° F.**

Service

| Gasoline Vapor to Crude | | Kerosene to Water | |
|---|---|---|---|
| Plain steel | 8 mo. | Plain steel | 7 mo. |
| 18-8 | 15 mo. | 18-8 | 23 mo. |
| Admiralty | 15 mo. | Admiralty | 15 mo. |

Naphtha to Crude

| | | | |
|---|---|---|---|
| Plain steel | 15 mo. | Admiralty | 15 mo. |

**C. GAS OIL TO WATER**

| Under 215° F. | | Over 215° F. | |
|---|---|---|---|
| Plain steel | | Plain steel | 3 mo. |
| 18-8 | 19 mo. | 18-8 | mo. |
| Admiralty | 26 mo. | Admiralty | 17 mo. |

**GAS OIL TO CRUDE**

Temperatures 80° to 440° F.

| | | | |
|---|---|---|---|
| 18-8 | 3 mo. | Plain steel | 6 mo. |

**C. WITH TEMPERATURES 90° TO 460° F.**

Service—Condensing Naphtha to Water

| Metal— | First failure | Average life | Cause of failure |
|---|---|---|---|
| 18-8 | 9½ mo. | 21 mo. | Pits and cracks |
| Admiralty | 2½ mo. | 14 mo. | Dezincification |
| Arsencial brass | 5 mo. | 22 mo. | Pits and cracks |
| Copper lined Admiralty | | 23 mo. to date | |
| British Barronia | | 17 mo. to date | |
| Alcunic | 12½ mo. | 14½ mo. to date | Sulphide corrosion |

# Use of Nickel-Bearing Alloys in Oil Refineries

By BYRON B. MORTON
International Nickel Co.

In a refinery in which a complete line of petroleum products is prepared, metal temperatures will be encountered that range from —70° F., and lower, to about 2,000° F. Over this entire temperature range, nickel is an important alloying element, and at the lower and upper ends of the range it is practically indispensible as an alloying agent.

### Low Temperature Range

Within the low temperature range below 32° F., in which dewaxing of lubricating oils is carried out, the impact value of most steels decreases to a marked extent. The nickel-bearing steels containing 3 to 5 per cent of nickel retain a good portion of their room temperature impact resistance at sub-zero temperatures as may be seen from Figure 1. The alloys rendered austenitic by additions of nickel to an iron base retain excellent impact values down to the temperature of boiling liquid air, as may be seen from Figure 2, and the austenitic chrome-nickel alloys of the 18-8 type also retain excellent impact values down to —100° F., as shown in Figure 3, from data by Sergeson.

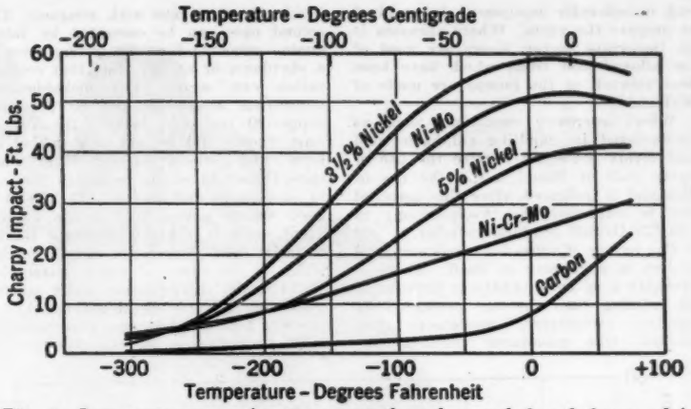



*Fig. 1—Low temperature impact properties of annealed and drawn plain carbon and nickel alloy steels*

| Steel— | Composition, % C | Mn | Ni | Cr | Mo | Furnace cooled from, ° F. | Drawn at, ° F. | Brinell hardness |
|---|---|---|---|---|---|---|---|---|
| Carbon | 0.32 | 0.44 | ... | ... | ... | 1,500 | 1,200 | 140 |
| 3.5% Ni | 0.10 | 0.45 | 3.41 | ... | ... | 1,450 | 1,200 | 138 |
| 5.0% Ni | 0.10 | 0.34 | 5.13 | ... | ... | 1,450 | 1,200 | 152 |
| Ni-Mo | 0.12 | 0.45 | 3.58 | ... | 0.27 | 1,450 | 1,200 | 163 |
| Ni-Cr-Mo | 0.30 | 0.54 | 3.52 | 0.93 | 0.27 | 1,450 | 1,200 | 250 |

Among nickel-bearing nonferrous alloys Monel metal (68 per cent nickel—28 per cent copper) has outstanding qualifications for low temperature uses. The alloy loses none of its impact value down to —297° F., as may be seen from Table 1,[1] while the strength and yield point increase in value at sub-zero temperatures over the values obtained at room temperature. The endurance limits of Monel metal also increases at sub-zero temperatures according to Russell.[2]

The 2¼ per cent nickel steels with low carbon contents have been adopted and widely used for fabrication of large vessels used in connection with dewaxing of lubricating oils. Some of the vessels fabricated of this alloy steel exceed 11 feet in diameter. Certain considerations that led to the use of the 2¼ per cent nickel steels for large welded vessels for low temperature service have been discussed by R. K. Hopkins[3] and appear among other things to have been: ease of fabrication, satisfactory weldability and high impact values in both plate and weld at low temperatures (—50° F.) following a simple stress relieving heat treatment of 1,150° F., such as called for in the pressure vessel codes. The 2¼ to 3 per cent nickel steels are also used for piping, pipe fittings and attachments to vessels, as a result of their high impact values at low temperatures. Parts made of low carbon (0.10 per cent C.) cast nickel steels retail good impact values to —114° F., as shown by Bull,[4] who gives the following for impact values of cast steel. These cast nickel steels find use in valve bodies and fittings; also in pump parts—as casings, impellers, cylinders and pistons.

Monel metal is used as centrifuge bowls for operating at low temperatures in the removal of wax from oils. These bowls are subject to high tangential stresses and to the impact and reversal of thermal stresses that occur when cold — and sometimes hot — charging stocks are introduced. The high yield point of Monel metal makes it of particular value as a material for centrifuge bowls.

That the low temperature service of metals will increase in scope is indicated by the researches under way upon the effects of low temperatures in modifying certain reactions and in increasing the selective action of solvents. The austenitic steels and Monel metal will probably come into increased use where very low temperatures of the metal are encountered.

### Middle Temperature Range

It is within the range of metal temperatures of say from 32° F., to 1,400° F., that the bulk of alloys find their use in the refineries. Corrosion is an important factor in the selection of alloys for vital parts of equipment used within this range. Where the metal temperature is sufficiently low, condensation of moisture and acids occurs and attack from electrolytic corrosion is important. Above a temperature that permits condensation, vigorous attack from sulphur-bearing gases is an important factor.

TABLE 2—PROPERTIES OF TWO CAST STEELS AT ROOM AND AT SUB-ZERO TEMPERATURE. (BULL).

| Cast steel— | Composition, % C | Mn | Ni | Tension tests (room temp.) Tensile strength, lbs./sq. in. | Yield point, lbs./sq. in. | Elongation in 2", % | Reduction in area, % | Izod impact— ft. lbs. at Room temp. | —114° F. |
|---|---|---|---|---|---|---|---|---|---|
| Carbon | 0.21 | 0.70 | ... | 71,840 | 37,195 | 34.8 | 55.3 | 36.0 | 3.0 |
| Nickel | 0.10 | 0.69 | 2.48 | 68,300 | 50,925 | 36.8 | 66.1 | 71.6 | 16.6 |

Ni-Resist,[5] one of the most interesting and rapidly becoming one of the most widely used nickel-bearing alloys employed in refineries, finds wide application within the temperature limits that permit acids and moisture to exist. The alloy is used to line pumps that will handle crudes, reflux material, sludge acid, caustic, corrosive waters, and a number of other materials. The liners are either sand or centrifugally cast. Valve parts for pumps handling corrosive substances are also made of this alloy. It is used as a trim for gate valves, and is particularly used as a trim where the water accompanying crudes is of an acid nature.

Refluxes are often corrosive and are especially so when the material refluxed is directly from a crude containing salts that break down to form hydrochloric acid. In this case the reflux attacks pumps, lines and parts of the towers. Ni-Resist bubble caps and trays are used where rapid corrosion from acids is a factor. The pumps handling the corrosive reflux material are often cast of Ni-Resist, and in a number of cases the lines conveying the reflux back to the tower are of this alloy. The use of cast iron within "battery limits" is a matter of policy and regulates the use of Ni-Resist lines. The towers are often protected by cement lining from acid attack but where cement cannot be applied thin-gauge Monel metal sheet is used. Protection in this manner by Monel metal sheet can be given heads, manholes and nozzles.

The high nickel alloys, as Monel and Ni-Resist, are attacked by sulphur-bearing gases at high temperatures. They find their chief use where, due to the presence of moisture, the sulphur compounds act as acids. For example, Monel metal resists well the action of corrosive, sulphur compounds in refinery gases and is widely used as orifice plates and valve trim in this service. Headers and sheets of Ni-Resist are used in the coolers handling refinery gases which are compressed prior to going to absorption units which recover the gasoline and light fractions from these gases. This is a location of severe corrosion. Where sulphur vapors at temperatures above 300° F.[6] are encountered, the 18 per cent chromium alloys with 8 per cent nickel are widely and effectively used. The use of these 18-8 alloys covers: coil tubes, exchanger tubes, bubble caps especially for the bottom of the towers, liners, pump rods, and a host of other applications.

Hot oil pumps often offer problems in selection of material for plungers or rods. Alloys containing approximately 20 to 22 per cent nickel, 8 to 10 per cent chromium, 0 to 1.0 per cent copper, 0 to 1.0 per cent silicon, and about 0.15 per cent carbon, are used in some cases. These alloys have the widest application for pump rods and plungers of any alloy type encountered by the writer. They are used for hot oil pumps, pumps handling cold acids and bases—including ammonia—reflux material, brines, water and oils, and are apparently quite satisfactory for all these varied uses. An interesting method of getting around plunger-scoring has been adopted by some refiners. The original plunger is turned down and a sleeve of a chrome-nickel-molybdenum alloy cast iron which has been hardened to 500-600 Brinell number, is placed on it. Needless to say, the assembling of this plunger is not to be undertaken by an inexperienced person,

[1] Data supplied through courtesy Union Carbide & Carbon Corp.'s Research Laboratory, Niagara Falls, N. Y.

[2] "Effect of Low Temperatures on Metals and Alloys," by H. W. Russell, A.S.T.M.-A.S.M.E. Symposium on Effect of Temperature on the Properties of Metals, June, 1931.

[3] R. K. Hopkins, director metallurgical research, M. W. Kellogg Co., on "Impact Resistance of Some Steels and Welds at Sub-Zero Temperatures," American Welding Society, Fall meeting, 1934.

Also "Mechanical and Non-Destructive Testing of Vessels and Welds with Particular Reference to Sub-Zero Operation," paper before British Iron and Steel Institute, May, 1935.

[4] "Performances of Cast Carbon and Low Alloy Steels in High and Low Temperature Service," by R. A. Bull, A.S.T.M.-A.S.M.E. Symposium on Effect of Temperature on the Properties of Metals, June, 1931, pp. 260-298.

[5] Ni-Resist is an austenitic cast iron of the composition: Total carbon 2.75-3.10; silicon 1.00-2.00; nickel 13.00-15.00; copper 5.0-7.0; chromium 1.25-4.00; manganese 1.00-1.50. It is nonmagnetic and may be identified by this property.

[6] It is practically impossible to sharply define this temperature limit of usefulness of nickel alloys, for while it is recognized Monel metal is vigorously attacked by sulphur at high temperatures, yet plugs in header boxes of fired coils of cast Monel metal have given and are giving excellent service.

TABLE 1—RESULTS OF SOME LOW TEMPERATURE TESTS OF MONEL METAL

| C | Mn | Fe | S | Si | Cu | Ni |
|---|---|---|---|---|---|---|
| 0.14 | 1.07 | 1.30 | 0.005 | 0.06 | 29.66 | 67.74 |

| Heat treatment— | Condition of sample— | Yield point, lbs./sq. in. | Max. strength, lbs./sq. in. | % Elong. in 2" | % Red. of area | Ft. lbs. Izod impact | Charpy—ft. lbs. std. "V" notch—0.01" rad. at bottom |
|---|---|---|---|---|---|---|---|
| Forged | As received; tested at room temperature | 68,000 | 92,000 | 32.0 | 73.7 | 119 | 216 |
| Forged | Held one-half hr. at (—)183° C. (297.4° F.) | 91,500 | 128,250 | 44.5 | 71.8 | 119 | 216 |
| Forged | Held 72 hrs. at (—)183° C. (297.4° F.) | 92,500 | 130,000 | 43.0 | 72.7 | 119 | ... |
| Forged | Same but tested at room temperature | ..... | ..... | ... | ... | 119 | ... |
| Heated at 1,750°-1,800° F., for 20 minutes and air cooled | As received; tested at room temperature | 29,000 | 79,000 | 46.0 | 77.1 | 100 | 189 |
| Ditto | Held one-half hr. at (—)183° C. (297.4° F.) and tested | 49,500 | 115,250 | 49.5 | 73.9 | 119 | 184 |
| Ditto | Held 72 hrs. at (—)183° C. (297.4° F.) and tested | 51,250 | 113,000 | 47.5 | 74.1 | 120 | ... |
| Ditto | Held 72 hrs. at (—)183° C. and tested at room temp. | ..... | ..... | ... | ... | 102 | ... |

and considerable equipment is required to prepare the parts. Where abrasion is an important factor, liners are used of the alloyed cast irons which have been heat treated, or the pumps are made of Ni-Hard.[1]

Where corrosive conditions such as encountered in handling sulphuric acid and reflux materials require the use of pump rods of Monel metal, the use of K-Monel is indicated, since this material can be hardened (by precipitation) to 300-375 Brinell hardness number.

The matter of tubes for condensers and coolers is a chapter in itself. There is probably a no more vexatious problem in oil refining than the one presented by tubular exchangers, condensers and coolers. One prominent engineer has stated that if a suitable tubing could be found, the open box type of cooler would disappear, and a refinery metallurgist of note looks upon the question of cooler and condenser tubes as the most pressing one before the industry. Some of the most efficient exchangers known to the writer have tubes of 18-8 material. However, a number of cases of failure of 18-8 bundles have come to his attention. The failures noted were due to two causes, the first of which is poor design that did not allow the tubes to freely expand resulting in fatigue failures and rupture in tension. The second cause of failure is attack by reducing acids. The high chromium alloys by virtue of building up a dense film of oxides or sulphides are quite resistant to oxidizing acids and sulphur-bearing gases at high temperature but these alloys are poorly resistant to reducing acids, as sulphuric and hydrochloric acids. (Sometimes an oxidizing agent is added to sulphuric acid and 18-8 alloys can be used with complete satisfaction.) Correction of the causes of 18-8 tube failures listed above lies in the first case with designers. The second case can be corrected by introducing ammonia into the system prior to a shutdown or at any time that condensation can occur. The nickel-bearing nonferrous alloys—as the 80 per cent copper-20 per cent nickel; the 70 per cent copper and 30 per cent nickel alloys, and others—are gaining widespread acceptance in refineries for use in condensers and coolers. The 70-30 is used where sea water is the cooling agent, since it is highly resistant to this material and especially resists pitting which is the cause of much destruction of Admiralty tubing in sea water service. Tubes of pure nickel, Monel metal, and of 18-8 plus molybdenum, are appearing more in refineries as the technologists turn their attention to by-products. The 18-8 plus molybdenum tubes are made up by welding plates.

Nickel-bearing alloys find their use around fired coils in the form of parts of header boxes, valves and fittings and also as tubing where 18-8 tubes are used. The 18-8 tubes have been rightly described as the aristocrat of tubes, since they give excellent performance but vent a "lordly wrath" when abused. It has become recognized that the temperature of the tube walls should not be allowed to exceed 1,200-1,300° F. The result of this requirement is that a special feed for coils of 18-8 tubes is necessary. This feed must be clean and refractory, and when these conditions are met the coils equipped with 18-8 tubes are excellent gasoline producers. Where 18-8 tubes are used to convey hot oils to and from various part of units the rate of inspections is materially reduced due to low corrosion rates and "turn-around" time is shortened. This use of 18-8 tubing as conveying lines is looked upon by some as being the most logical application of the alloy.

Steels of the S.A.E. 4,300 series (chrome-nickel-molybdenum) are used for flanges, bolts and highly stressed parts. The S.A.E. 4,600 series (nickel-molybdenum) is also widely used, especially for bolts. Forgings of the 2½ per cent nickel steels find application in large shafts and for piston rods where high fatigue stresses are encountered.

The use of chlorinated solvents in refining has been mentioned in the literature. A number of these solvents break down somewhat when heated in the presence of steam during the recovery operation. The metal of the vessel used in distilling plays an important part in the breakdown as may be seen from Table 3. In addition to causing breakdown of solvent at a slower rate than does steel, nickel and Monel metal are both quite resistant to the hydrochloric acid formed, which is not the case with steel; hence parts of distilling equipment used to recover these solvents will probably show wider use of these metals than is now the case. Monel is now used as orifice plates, thermocouple wells and trims. Nickel, nickel-clad plate and Monel metal are used in the dry cleaning industry where this problem of solvent breakdown has been encountered for a number of years.

In treating of oils with acids the time of contact is considered important and is controlled in a well-known process by using high speed centrifuges to remove the acid. The bowls used are of Monel metal. Similar bowls are used to remove finely dispersed acid sludge from lubricating oils.

Where a separation of acid and sludge from heated oils is done by gravity, the problem of a valve is often of importance, especially if the temperature of the material handled is 180-200° F. Monel metal valves trimmed with an alloy containing 50 per cent or more of nickel, 4.0-20.0 per cent molybdenum, also chromium and tungsten, is found to be satisfactory. This highly alloyed material makes good tips for burners where acid sludge is the fuel, though S-Monel and Ni-Resist cast iron are both used for this service. The results of some tests of Monel metal in hot sulphuric acid are shown in Figure 4.

Pump valves in high-pressure, high-temperature pumps are often of the 24-28 per cent chromium-12 per cent nickel type alloy.

A considerable amount of nickel-bearing alloys is used in the form of sprayed coatings. Pump rods are built up with 18-8 metal; pump impellers handling corrosive waters are sprayed with Monel metal; seats of valves are built up with 18-8 and Monel metal; vessel walls are sprayed with 18-8 material when attack from hot sulphur-bearing compounds is taking place. This unique method of coating material with a metal spray is widely used, but the relative position of this type of surfacing with respect to corrosion resistance is not yet thoroughly established.

The atmosphere within storage tanks is often quite severely corrosive. Monel metal is used in tanks as the cable on swing pipes and parts of permanent gauging equipment. The usual portable gauging equipment is often made of Monel metal. Since this equipment is constantly in use it might be quite resistant to the conditions encountered in storage tanks.

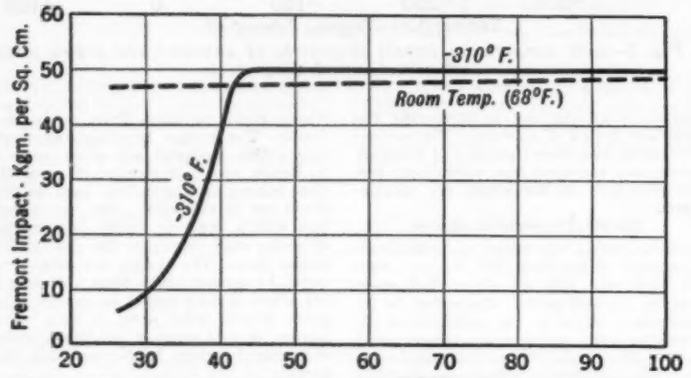



*Fig. 2—Effect of nickel content upon the Fremont impact resistance of iron-nickel alloys at the temperature of boiling liquid air*

(²P. Chevenard: Etude de la fragilite des ferro-nickels aux basses temperatures. Rev. Met. Mem. 19, part I, [1922] p. 209.)

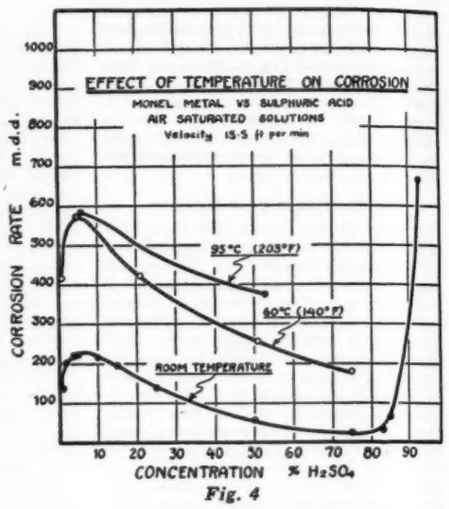



*Fig. 4*

[1]Ni-Hard is a cast iron containing 4-6 per cent nickel and 1-2.5 per cent chromium and can develop Brinell hardness values up to 600 B.H.N. It is used where abrasion is a factor.

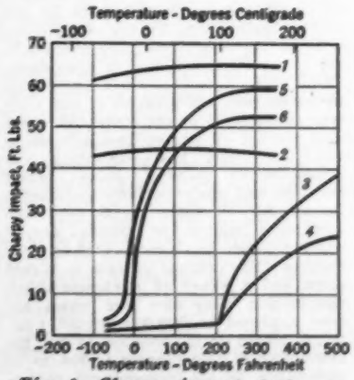



*Fig. 3—Charpy impact tests on stainless irons. (Sergeson)*

1. 18% Cr, 8% Ni, Quenched in Water from 1,950° F.
2. Same as 1, Cold Drawn.
3. 18% Cr, Annealed.
4. Same as 3, Cold Drawn.
5. 14% Cr, Annealed.
6. Same as 5, Cold drawn.

**TABLE 3—EFFECTS OF METALS IN THE DECOMPOSITION OF BOILING CARBON TETRACHLORIDE IN THE PRESENCE OF WATER**

Experimental conditions:
Amount of carbon tetrachloride ..... 480 to 560 gr.
Duration of test ..... 7 days
Metal exposure ..... 25% of area to liquid carbon tetrachloride
25% of area to liquid water
50% of area to mixed vapors

**Results**

| Metal— | Total area of specimen sq. cm. | Loss of weight of specimen in mg. | Weight of chlorine as chloride from hydrolysis of carbon tetrachloride in mg. |
|---|---|---|---|
| Blank | ... | .... | 31 |
| Blank | ... | .... | 30 |
| Blank | ... | .... | 26 |
| Steel | 57.5 | 3,517 | 3,829 |
| Steel | 42.8 | 2,117 | 2,237 |
| Steel | 42.8 | 4,419 | 5,022 |
| Steel | 42.8 | 4,923 | 5,913 |
| Nickel | 53.4 | 42 | 87 |
| Nickel | 54.4 | 18 | 54 |
| Nickel | 52.0 | 63 | 89 |
| Nickel | 52.0 | 443 | 504 |
| Monel metal | 54.4 | 103 | 149 |
| Monel metal | 53.9 | 44 | 95 |
| Monel metal | 52.5 | 62 | 93 |
| Monel metal | 53.5 | 57 | 105 |

Paul S. Brallier—private communication by correspondence—1934.

**TABLE 4**

| Alloy No.— | Nickel, per cent | Sag of bar at 1,600° F. | Sag of bar at 2,000° F. |
|---|---|---|---|
| 11 | 0.0 | 1.33" | 1.56+ |
| 12 | 2.9 | .65 | 1.56+ |
| 13 | 6.06 | .22 | .68 |
| 14 | 10.16 | .08 | .34 |
| 20 | 15.32 | .10 | .32 |
| 21 | 19.55 | .08 | .24 |
| 22 | 23.82 | .06 | .24 |

**TABLE 5**

| | Composition | | | | Total elongation |
|---|---|---|---|---|---|
| | Chromium | Nickel | Silicon | Carbon | in 2" in 475 hours |
| A | 26.2 | 4.17 | 1.25 | 0.37 | Flow too rapid to record. Test concluded at once. |
| B | 25.9 | 10.97 | 1.40 | 0.26 | 0.05023 inch |
| C | 25.5 | 20.52 | 1.40 | 0.37 | 0.00667 inch |

## High Temperature Range

The supports for tubes in fired coils represent a large tonnage of heat-resistant alloys. The most generally used alloys are castings that contain 25-30 per cent chromium with 10-14 per cent nickel. The nickel acts to give strength to the casting, as may be seen from the data for alloys containing 20 to 30 per cent of chromium and nickel as given in the following table from a paper on "Heat Resisting Castings," by F. A. Fahrenwald:[3]

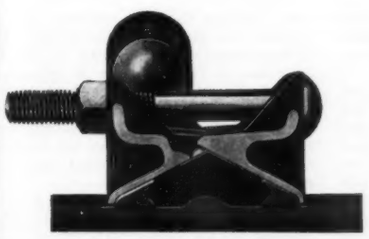
Certain experiments carried out at the laboratory of the International Nickel Co. also throw some light on the subject of the effects of nickel on strengthening of heat resisting alloys. The test consisted in holding specimens at 1,800° F., until temperatures were constant, then loading with 3,000 pounds per square inch, and noting the rates of flow.

The subject of sulphur attack upon high nickel content alloys is one which is little understood. As far as resistance to sulphur attack is concerned, the experience of this writer is that chromium can protect an equal per cent of nickel and that destruction of an alloy with 25 per cent chromium and 20 per cent nickel will be no more rapid at 1,800° F. than will be the destruction of a 25 per cent

(Continued on Page 64)

[3]"Heat Resisting Castings," by F. A. Fahrenwald, presented before the Combustion Engineering Division of the A.I.&S.E.E. at the Spring Engineering Conference held in Youngstown, Ohio, April 11 and 12, 1934.

## A Two-Purpose Clamp . . . .



Section shows how gasket is SEALED. Note Monel metal sheath band at top of gasket, and hard vulcanized rubber tips at sides. No chance of contact with soil or air. Holds up to 600 lb. pressure.

# SKINNER HIGH PRESSURE WELD CLAMP

(1) for pin hole leaks or splits in welded steel pipe— (2) to replace, without disturbing the line, mechanical couplings which are leaking.

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Saves expense and labor of removing pipe—eliminates service shutdowns. Instantly applied by one man. Direct in action, it stops original leak. Much cheaper than a mechanical split sleeve. AN ABSOLUTELY PERMANENT REPAIR. Write for prices.

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# Temperature Distribution and Stresses in Tubes of Refinery Pipe Stills

BY JESSE WILLIS BONNER
The Rice Institute

One of the most useful pieces of equipment in the oil refining industry is the pipe still heater. The heater usually consists of a radiant section followed by a convection section. Oil flows through the convection section and then through the radiant section.

In the last four or five years the oil pressure in the radiant section has run as high as 1,000 pounds per square inch and the oil temperature as high as 900°F. When high rates of heat transfer are maintained (20,000 B.T.U. per square foot), the carbon steel tube has not been entirely satisfactory. This may be due to the existence of temperature stresses or due to the pressure stresses being higher than a stress which will produce one per cent deformation during the calculated life of the tube. Whereas the existence of combined pressure and temperature stresses is not generally accepted by designers, practice indicates that the stresses which occur in the tube are greater than those shown by a pressure analysis alone. Satisfactory service can be insured only when the stresses existing in the tube are less than a creep stress which would produce one per cent deformation of the tube during a period equal to the calculated life of the tube.

The following analysis indicates that the stresses existing in the tube are equal to the pressure stress plus approximately 10 per cent of the calculated temperature stresses. Since an accurate determination of creep stresses is not possible at the present time, the existence of temperature stresses in any magnitude at high temperatures becomes doubtful. Even in the event that the temperature stresses are disregarded entirely, the temperature distribution in the tube is of great importance in the selection of a proper value of creep stress to be used in the design of the tubes. An example of such a temperature distribution diagram is shown in Figure 5.

The following types of stresses were considered.

1. Pressure stresses.
2. Temperature stresses.

Among the pressure stresses, the circumferential stress is the controlling stress since the radial stress is much smaller and the axial stress is zero.

When the wall of a cylinder is heated non-uniformly, its elements do not expand uniformly and mutual interference sets up stress.

Among the temperature stresses, the circumferential stress is more important than the axial or radial stress. The radial stress is smaller than the circumferential stress but both are subject to relief by creep or plastic flow of the metal. The axial stress is subject to relief by creep and by bowing of the tube.

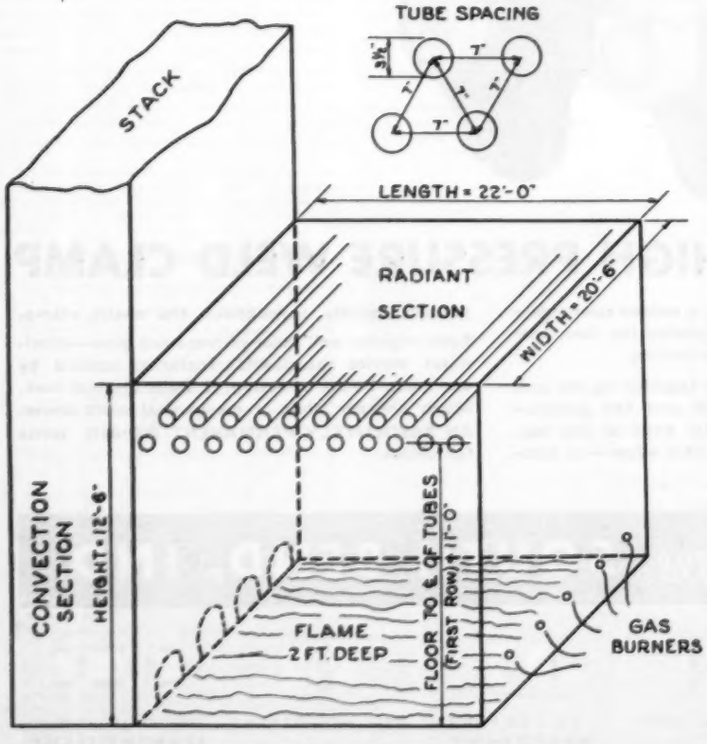



*Fig. 1—Furnace design used as basis for example*

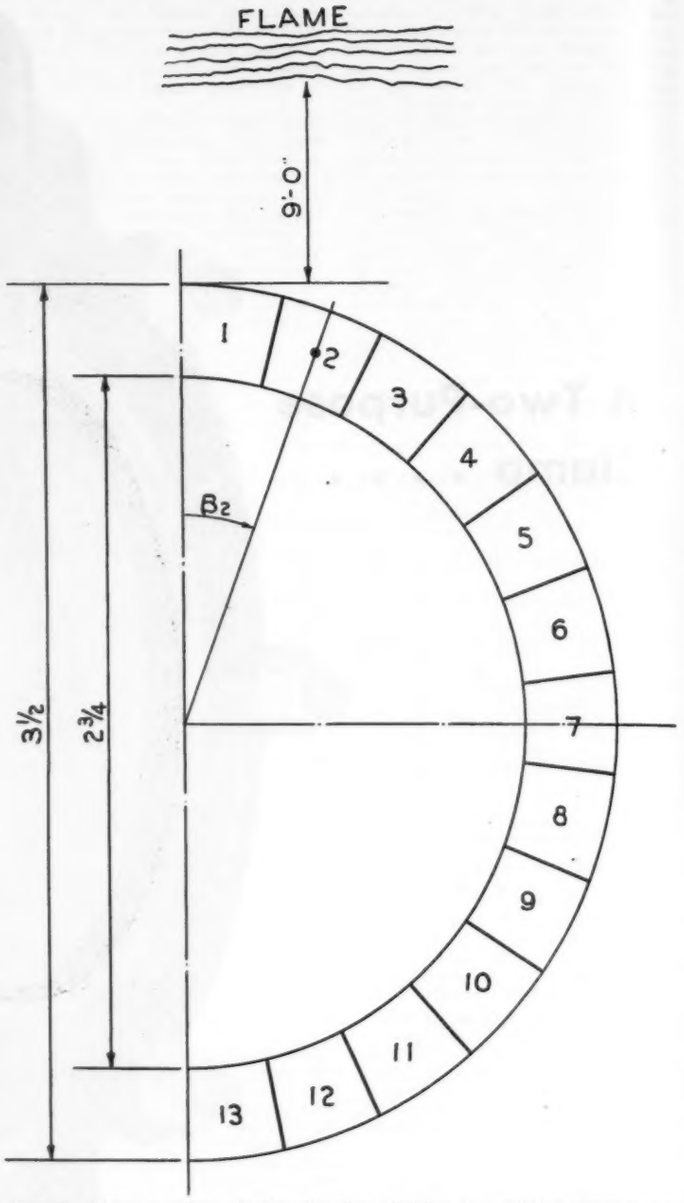



*Fig. 2—Cross section of tube showing division for solving temperature gradient*

The dead weight stresses may be minimized by providing an adequate number of supports for the tube and consequently are of no importance here.

Two cases were analyzed in this paper. One was that of an unsatisfactory carbon steel tube and the other was that of a highly satisfactory stainless steel tube. The carbon steel tube contained oil at 700°F. and at a pressure of 900 pounds per square inch. Failures of this type of tube indicate that approximately 10 per cent of the calculated temperature stresses were in existence. The stainless steel tube was a chrome nickel steel, namely KA2S. It contained oil at 900°F. and at a pressure of 1,000 pounds per square inch. This type of tube has given four years of satisfactory service.

The resistance of the oil film in the tube to conduction of heat is of utmost importance in determining the temperature distribution diagram. This film coefficient is a function of the conductivity, the viscosity and the velocity of the oil in the tubes. The conductivity and viscosity of the oil cannot be controlled and consequently the selection of the best velocity is of great importance. In general, the higher the velocity of the oil in the tubes, the better the conductivity of the oil film.

### Temperature Distribution

The furnace shown in Figure 1 furnished the data for the following example. Consider the first row of tubes. According to McAdams (McAdams' Heat Transmission), 96 per cent of the heat absorbed by the first row of tubes is absorbed directly, when the back wall of the furnace is a re-radiating non-conducting refractory. In this particular case, the heat absorbed on the back side of the tube is negligible for stress calculation purposes.

The lining of the furnace is XX Fire Brick. The tube material is KA2S, a chrome nickel steel (Cr 17.06%, Ni 10.20%, Si 0.93%, Mn 0.25%, C 0.068%). The most strenuous operating conditions of any tube on the first row are, pressure 1,000 lbs./sq. in., temperature of oil in the tube 900°F.

The capacity of the still is 16,900 gals/hr. measured at 60°F. A typical oil run is a Gulf Coast 39° Baume, with a viscosity of 4 centipoise at 100°F. The heat input is known to be 20,000 B.T.U.'s per square foot of mean circumferential area of the tube.

The following set of units will be used throughout this paper.

### Consistent Units

A—Surface of body exposed to heat—sq. ft.

C—Specific heat of a metal.

h—Coefficient of heat transfer—B.T.U./(hr.) (sq. ft.) (deg. F.).

k—Thermal conductivity—B.T.U./(hr) (sq. ft.) (deg. F/ft.).

L—Thickness—ft.
Q—Quantity of heat—B.T.U.
t—Temperature at point in material—°F.
ρ—Density of solid—lbs/cu. ft.
D—Diameter inside—ft.
G—Mass velocity—lbs/(hr.) (sq. ft. of cross-section).
μ—Absolute viscosity—lbs./(hr.) (ft.) = 2.42 x viscosity in centipoises.

The heat flows considered will be for a period of one hour.

The first computation will be the rate of heat transfer into the tube.

The effect of curvature of a tube on heat flow is given by Schach, Goldschmidt and Partridge in the formula:

$$Q = \frac{k\pi\,(D_{inside} + D_{outside})\,(t_{in} - t_{out})}{2L\Phi}$$

for a unit length of tube.

For this case

$$\frac{D_{out}}{D_{in}} = \frac{3.5 \times 12}{2.75 \times 12} = 1.27$$

For this ratio of 1.27, $\Phi = 1.0038$ and is negligible. (See Schach's Industrial Heat Transfer).

The viscosity of the oil at 900°F. is 0.0022 poises (see Appendix 1). The specific heat at 900°F. is 0.90. This data was furnished by the C. F. Braun Co.

Specific gravity of the oil = 0.83 at 60°F. Density at 60°F. = 0.83 × 62.4 = 51.8 lb/cu. ft.

Conductivity of KA2S = 16 B.T.U./(hr.) (sq. ft.) (°F/ft.) at 900°F. (See K. W. Martin—Massachusetts Institute of Tech.)—McAdams.

Conductivity of the oil at 900°F.: 0.028 B.T.U./(hr.) (sq. ft.) (deg. F/ft.) (See McAdams—Heat Transmission).

Volume of oil = 16,900 gas./hr.

Velocity at 60° F. =

$$\frac{\dfrac{16900 \times 0.1337}{3600}}{\left(\dfrac{2.75}{2\times12}\right)^2 \pi} = 15.2 \text{ ft/sec.}$$

D = 2.75" = 0.229 ft.

G = 15.2 × 51.8 × 3,600 = 2,830,000 lb./(hr.) (sq. ft. of cross sec.).

μ = 0.22 × 2.42 = 0.533 lb/(hr.) (ft.)

$$\frac{DG}{\mu} = \frac{0.229 \times 2{,}830{,}000}{0.533} = 1{,}220{,}000$$

Substituting these values in

$$\frac{hD/k}{\left(\dfrac{c\mu}{k}\right)^{0.4}} = 1{,}510$$

(See Appendix Part 2 for derivation).

$$\text{Then } \frac{hD}{k} = 1{,}510 \left(\frac{c\mu}{k}\right)^{.4}$$

$$h = 1510 \times \frac{k}{D} \times \left(\frac{c\mu}{k}\right)^{.4} =$$

$$1510 \times \frac{.028}{.229} \times \left(\frac{.90 \times .533}{.028}\right)^{.4}$$

$h_{oil}$ = 575 B.T.U./sq. ft/hr/deg. F. flowing through oil film. Consider 1 sq. ft. mean circumferential area of metal in the tubes.

$$Q = \frac{k}{L} = \frac{16}{\frac{5}{8}} \times 12 = 513 \text{ B.T.U./hr/sq. ft/deg. F.} = h_m.$$

At this point it is noticed that

$$\frac{h_{oil} \times \text{Area of oil film in a 12" length of tube}}{h_m \times \text{Mean circum. area of metal in a 12" length of tube}} = \frac{575 \times 0.72}{513 \times 0.82} = 1$$

Then the radial temperature drop across the metal in the tube will be equal to the radial drop across the oil film at any point in question.

Figure 2 illustrates the manner in which the cross section of the tube is

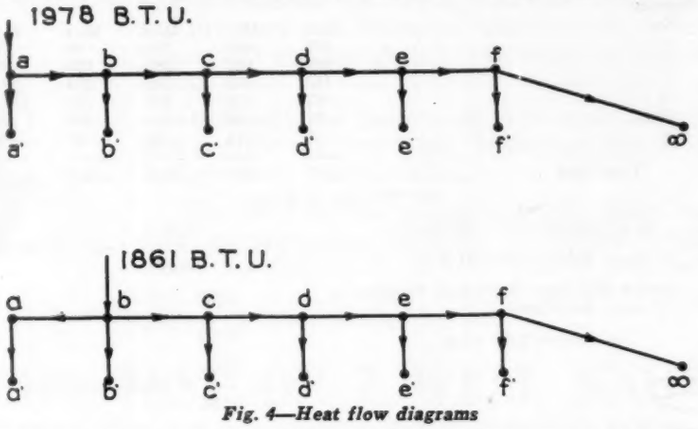



*Fig. 4—Heat flow diagrams*

divided in order to make a temperature gradient solution.

The number of segments =

$$\frac{\text{Mean circumference}}{\text{Thickness of tube}} = \frac{3.125 \times \pi}{0.375} = 26.1$$

The tube is divided into 26 segments.

Then the thickness and the resistance of a segment of metal radially is equal to the thickness and the resistance of the metal between the centers of the segments circumferentially.

The heat flowing into each segment is proportional to $\cos\beta$ where $\beta$ is the angle between a line perpendicular to the plane of the flame and a radial line through the center of the segment. This is due to the fact that the projected area of any segment on the plane of the flame is proportional to the cosine of $\beta$.

Consider a section of the 3½" × 2¾" tube 1 ft. long. The mean circumferential area of the tube section is 0.82 sq. ft.

Let $Q_1$ = the total heat flowing into the section.

$Q_1 = 20{,}000 \times 0.82 = 16{,}400$ B.T.U./hr.

Let $q_1$ = the heat flow into a segment if $\beta = 0$. Then:

$$q_1 \sum_{\beta_1}^{\beta_r} \cos\beta = 8{,}200.$$

In Table I it is noted $\sum_{\beta_1}^{\beta_r} \cos\beta = 4.1178$.

$$\text{Then } q_1 = \frac{8200}{4.1178} = 1{,}990 \text{ B.T.U.}$$

Then the heat flow into any segment is given by the formula $q_x = q_1 \cos\beta_x$.

These values are recorded in column 4 of Table 1.

Now heat flowing radially through any segment

$$Q_{seg} = h_m \times A \times dT_1$$

where $dT_1$ is radial temperature drop from the outside surface to the center of the segment.

$$dT_1 = \frac{Q_{seg}}{h_m \times A} = \frac{Q_{seg}}{513 \times 0.82 \times 2} = \frac{Q_{seg}}{32.2}$$

26

**TABLE 1**

| Segment number | β Degrees | β Cosine | Heat absorbed B.T.U. | $dT_1$ °F. |
|---|---|---|---|---|
| 1 ..... | 6.92 | 0.9928 | 1,978 | 61.5 |
| 2 ..... | 20.77 | 0.9350 | 1,861 | 57.8 |
| 3 ..... | 36.62 | 0.8229 | 1,638 | 50.8 |
| 4 ..... | 48.46 | 0.6631 | 1,321 | 41.0 |
| 5 ..... | 62.31 | 0.4636 | 925 | 28.7 |
| 6 ..... | 76.15 | 0.2394 | 477 | 14.8 |
| 7 ..... | 90.00 | 0.0 | 000 | 00.0 |
| Totals ..... | | 4.1178 | 8,200 | |

Let the radial resistance of each segment of metal be two units. Call the unit Z.

Then

Radial resistance of segment of metal = 2Z.

Circumferential resistance between centers of segments = 2Z.

Resistance of oil film on segment = 2Z.

The resistance of back 90° sector of the tube is now considered. Segments 7 to 13 are laid out in a straight line, for simplicity see Figure 3.

It is desirable to replace the combined resistance along the dotted line by a single resistance.

Let $R_{1-a}$ denote the resistance of the combined paths leading heat to the oil between any point i and the point r, excluding one radial resistance such as k — k' when i = k.

Let $R'_{1-a}$ denote a like resistance when the resistance along k — k' is included (i = k).

Then all radial paths i — i' have the resistance $\frac{2Z}{2} + 2Z = 3Z$.

Then:

$$R_{p-a} = R_{p-r} + R_{r-r'} = 2 + 3 = 5Z$$

$$\frac{1}{R'_{p-a}} = \frac{1}{R_{p-a}} + \frac{1}{R_{p-p'}} = \frac{1}{5} + \frac{1}{5} = 0.533$$

$$R'_{p-a} = \frac{1}{0.533} = 1.88Z$$

$$R_{n-a} = 2 + 1.88 = 3.88Z$$

$$\frac{1}{R'_{n-a}} = \frac{1}{3} + \frac{1}{3.88} = 0.591$$

$$R'_{n-a} = \frac{1}{0.591} = 1.69Z$$

$$R_{m-a} = 2 + 1.69 = 3.69Z$$

$$\frac{1}{R'_{m-a}} = \frac{1}{3.69} + \frac{1}{3} = 0.604$$

$$R'_{m-a} = \frac{1}{0.604} = 1.66Z$$

$$R_{k-a} = 2 + 1.66 = 3.66Z$$

$$\frac{1}{R'_{k-a}} = \frac{1}{3} + \frac{1}{3.66} = 0.606$$

$$R'_{k-a} = \frac{1}{0.606} = 1.65Z$$

$$R_{j-a} = 2 + 1.65 = 3.65Z$$

$$\frac{1}{R'_{j-a}} = \frac{1}{3} + \frac{1}{3.65} = 0.607$$

$$R'_{j-a} = \frac{1}{0.607} = 1.65Z$$

Similarly:

$R_{g-a} = 3.65Z$ $\quad R'_{g-a} = 1.65Z$

Treating Segments 1-6 in the same manner. See Figure 3.

Here:

$R_{1-a} = 3.65Z$ $\quad R'_{1-a} = 1.65Z$

Let $R_{o-1}$ denote the resistance of the combined paths leading heat to the oil between any point i and point a excluding one radial resistance such as k — k' when i = k.

Let $R'_{o-1}$ denote a like resistance when the resistance such as k — k' is included (i = k).

Then the combination of resistances from Seg. No. 1 to 7 is the same as those from No. 13 to 7.

**Summary**

$R_{o-b} = R_{p-a} = 5Z$

$R'_{o-b} = R'_{p-a} = 1.88Z$

$R_{o-c} = R_{n-a} = 3.88Z$

$R'_{o-c} = R'_{n-a} = 1.69Z$

$R_{o-d} = R_{m-a} = 3.69Z$

$R'_{o-d} = R'_{m-a} = 1.66Z$

All other values:

$R_{1-a} = R_{o-1} = 3.65Z$

$R'_{1-a} = R'_{o-1} = 1.65Z$

Consider the heat flowing from segment to segment circumferentially to be positive when flowing in the direction of increasing values of $\beta$ and negative when flowing in the direction of decreasing values of $\beta$.

For purposes of computation the heat is assumed to flow into only one segment at a time from an external source. The amounts of flow along the various paths are recorded in Table 2.

Assume that heat flows into Segment No. 1 only. See Figure 4.

Now a', b', c', d', e', f' . . . r' are at the same temperature, namely 900° F.

Now:

$Q_a$ input = $Q_{a-b} + Q_{a-a'} = 1.978$ B.t.u. (from Table 1)

$$\frac{Q_{a-a'}}{Q_{a-b}} = \frac{R_{a-a}}{R_{a-a'}} = \frac{3.65}{3.00}$$

$$Q_{a-a'} = \frac{3.65}{3.65 + 3.00} \times 1{,}978 = 1{,}086 \text{ B.t.u.}$$

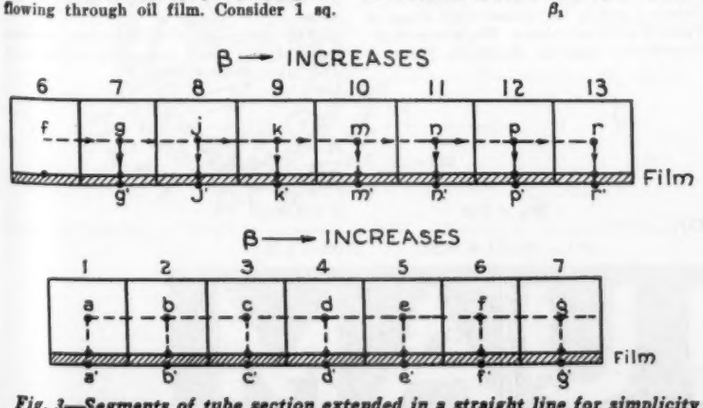



*Fig. 3—Segments of tube section extended in a straight line for simplicity of computation*

$$Q_{a-b} = \frac{3.00}{3.65 + 3.00} \times 1,978 = 892 \text{ B.t.u.}$$

Then $Q_b$ input = 892 B.t.u.

$$R_{b-a} + R_{b-b'} = 3.65 + 3.00 = 6.65$$

$$Q_{b-b'} = \frac{3.65}{6.65} \times 892 = 490 \text{ B.t.u.}$$

$$Q_{b-c} = \frac{3.00}{6.65} \times 892 = 402 \text{ B.t.u.}$$

Thus:

$$Q_{1-1} = \frac{3.65}{6.65} \times Q_1 \text{ input} = 0.549 \times Q_1 \text{ input}$$

$$Q_{1-(1,1)} = \frac{3.00}{6.65} \times Q_1 \text{ input} = 0.451 \times Q_1 \text{ input}$$

(For Segments 1-9)

$Q_c$ input = 402 B.t.u.

$Q_{c-c'} = 0.549 \times 402 = 221$ B.t.u.

$Q_{c-d} = 0.451 \times 402 = 181$

$Q_d$ input = 181 B.t.u.

$Q_{d-d'} = 0.549 \times 181 = 99$ B.t.u.

$Q_{d-e} = 0.451 \times 181 = 82$ B.t.u.

$Q_e$ input = 82 B.t.u.

$Q_{e-e'} = 0.549 \times 82 = 45$ B.t.u.

$Q_{e-f} = 0.451 \times 82 = 37$ B.t.u.

$Q_f$ input = 37 B.t.u.

**TABLE 2**

| Input to Segment No. | $Q_{a-a'}$ | $Q_{b-b'}$ | $Q_{c-c'}$ | $Q_{d-d'}$ | $Q_{e-e'}$ | $Q_{f-f'}$ | $Q_{f-g}$ |
|---|---|---|---|---|---|---|---|
| 1 | 1,086 | 490 | 221 | 99 | 45 | 20 | 17 |
| 2 | 461 | 768 | 347 | 156 | 71 | 32 | 26 |
| 3 | 183 | 306 | 630 | 285 | 128 | 58 | 48 |
| 4 | 67 | 111 | 230 | 501 | 226 | 102 | 84 |
| 5 | 21 | 35 | 73 | 159 | 349 | 158 | 130 |
| 6 | 5 | 8 | 17 | 37 | 81 | 181 | 148 |
| Total flow | 1,823 | 1,718 | 1,518 | 1,237 | 900 | 551 | 453 |

+ is in direction of increasing $\beta$

| Input to Segment No. | $Q_{a-b}$ | $Q_{b-c}$ | $Q_{c-d}$ | $Q_{d-e}$ | $Q_{e-f}$ |
|---|---|---|---|---|---|
| 1 | 823 | 402 | 181 | 82 | 37 |
| 2 | —461 | 632 | 285 | 129 | 58 |
| 3 | —183 | —489 | 519 | 234 | 106 |
| 4 | —67 | —178 | —408 | 412 | 186 |
| 5 | —21 | —56 | —129 | —288 | 288 |
| 6 | —5 | —13 | —30 | —67 | —148 |
| Total flow | +155 | +298 | +418 | +502 | +527 |

All values are in B.t.u.s

$Q_{f-f'} = 0.549 \times 37 = 20$ B.t.u.

$Q_{f-g} = 0.451 \times 37 = 17$ B.t.u.

Assume that heat flows into Segment No. 2 only. See Figure 4.

$Q_b$ input = 1,861 B.t.u.

$$\frac{1}{R_{a-b}} + \frac{1}{R_{b-b'}} + \frac{1}{R_{b-a}} = \frac{1}{5} + \frac{1}{3} + \frac{1}{3.65}$$

$$= 0.20 + 0.333 + 0.274 = 0.807$$

$$Q_{a-b} = Q_{a-a'} = \frac{0.20}{0.807} \times 1,861 = 461 \text{ B.t.u.}$$

$$Q_{b-b'} = \frac{0.333}{0.807} \times 1,861 = 768 \text{ B.t.u.}$$

$$Q_{b-c} = \frac{0.274}{0.807} \times 1,861 = 632 \text{ B.t.u.}$$

The process is continued here in the same manner as when heat flowed into Segment No. 1 only.

The heat is assumed to flow only into Segments No. 3, 4, 5 and 6, and a similar treatment given for each individual input from an external source. All flows are recorded in Table 2.

The total flow in the path f–g shown in the table as $Q_{f-g}$ = 453 B.t.u.

Using 453 B.t.u. as the input to Segment 7 and applying the same method as used for flow into Segment No. 1 only, the following heat flows were obtained:

$Q_{g-g'} = 249$ B.t.u. $Q_{m-m'} = 23$ B.t.u.
$Q_{j-j'} = 112$ B.t.u. $Q_{n-n'} = 11$ B.t.u.
$Q_{k-k'} = 50$ B.t.u. $Q_{p-p'} = 5$ B.t.u
$Q_{r-r'} = 3$ B.t.u.

As a check it is found that $\sum_a Q_{1-1'} =$ 8,200 B.t.u. The temperature drop across a resistance $Z = \frac{Q}{32.2}$. (See calculation of $dT_1$ of Table 1.) The temperature drop across any resistance $= \frac{QR}{32.2}$ when R is measured in units of Z.

Let us recall:

Radial resistance of a segment of metal = 2Z.
Circumferential resistance between centers of segments = 2Z.
Resistance of oil film on segment = 2Z.

Using the radial heat flows just calculated and those recorded in Tables 1 and 2, the temperature drops in Table 3 were calculated. The temperature distribution diagram shown in Figure 5 was then drawn using the values in Table 3.

The following column headings are used in Table 3:

$dT_1$ = radial temperature drop across outer half of metal.
$dT_2$ = radial temperature drop across oil film.
$dT_3$ = radial temperature drop from oil to middle of segment.
$dT_4$ = total radial temperature drop across oil film and metal = $dT_1 + dT_2$.
$dT_5$ = total radial temperature drop across the metal = $dT_4 - dT_2$.

**TABLE 3**

| Segment No. | $dT_1$ °F. | $dT_2$ °F. | $dT_3$ °F. | $dT_4$ °F. | $dT_5$ °F. |
|---|---|---|---|---|---|
| 1 | 62 | 113 | 170 | 232 | 119 |
| 2 | 58 | 107 | 160 | 218 | 111 |
| 3 | 51 | 94 | 141 | 192 | 98 |
| 4 | 41 | 77 | 115 | 156 | 79 |
| 5 | 29 | 56 | 84 | 113 | 57 |
| 6 | 15 | 34 | 51 | 66 | 32 |
| 7 | 0 | 15 | 23 | 23 | 8 |
| 8 | 0 | 7 | 10 | 10 | 3 |
| 9 | 0 | 3 | 4 | 4 | 1 |
| 10 | 0 | 1 | 1 | 1 | 0 |
| 11 | 0 | 1 | 1 | 1 | 0 |
| 12 | 0 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 | 0 |

The remainder of this paper deals with the stresses found in a tube in which the temperature varies as computed above.

### Pressure Stresses

Timoshenko's treatment of this subject in his "Strength of Materials" is applied to this case. In the particular case of a thick walled cylinder subject to internal pressure only, the circumferential stresses are of greatest importance and are a maximum and minimum at the inner and outer surfaces of the cylinder, respectively.

Considering the KA2S tube:

$\sigma_t$ = the circumferential stress in lbs./sq. in.
$p_i$ = pressure in the tube in lbs./sq. in. = 1,000 lbs./sq. in.
a = inner radius of the tube in inches = 1¾ in.
b = outer radius of the tube in inches = 1⅞ in.
r = radius of the tube at the point in question.

$$\sigma_t = \frac{a^2 p_i}{b^2 - a^2}\left(1 + \frac{b^2}{r^2}\right)$$

his "Strength of Materials." In this method the circumferential temperature gradient in the tube metal is assumed to be zero. The effect of a circumferential temperature gradient will be considered later.

The following symbols will be used:

a = inner radius of the tube in inches = 1¾ in.
b = outer radius of the tube in inches = 1⅞ in.
E = modulus of elasticity of the metal.
$\alpha$ = thermal coefficient of linear expansion.
v = Poisson's ratio.
$t_1$ = the radial temperature drop across the metal.
$E\alpha$ = 282 and v = 0.278 in the range 1,000°–1,100° F.

The maximum value of t = 119° F. (see Table 3) at the hottest point on the tube.

The maximum and minimum stresses occur at the inner and outer surfaces of the tubes respectively.

$$(\sigma_t)_{r=a} = -\frac{E\alpha\, t_1}{2(1-v)\log_e \frac{b}{a}}\left(1 - \frac{2b^2}{b^2 - a^2}\log_e \frac{b}{a}\right)$$

$$(\sigma_t)_{r=a} = -\frac{282 \times 119}{2(1-0.278) \times 0.239}\left(1 - \frac{2 \times 3.06}{3.06 - 1.89} \times 0.239\right) = +24,600 \text{ lbs./sq. in.}$$

$$(\sigma_t)_{r=b} = \frac{E\alpha\, t_1}{2(1-v)\log_e \frac{b}{a}}\left(1 - \frac{2a^2}{b^2 - a^2}\log_e \frac{b}{a}\right)$$

$$(\sigma_t)_{r=b} = \frac{282 \times 119}{2(1-0.278) \times 0.239}\left(1 - \frac{2 \times 1.89}{3.06 - 1.89} \times 0.239\right) = -22,400 \text{ lbs./sq. in.}$$

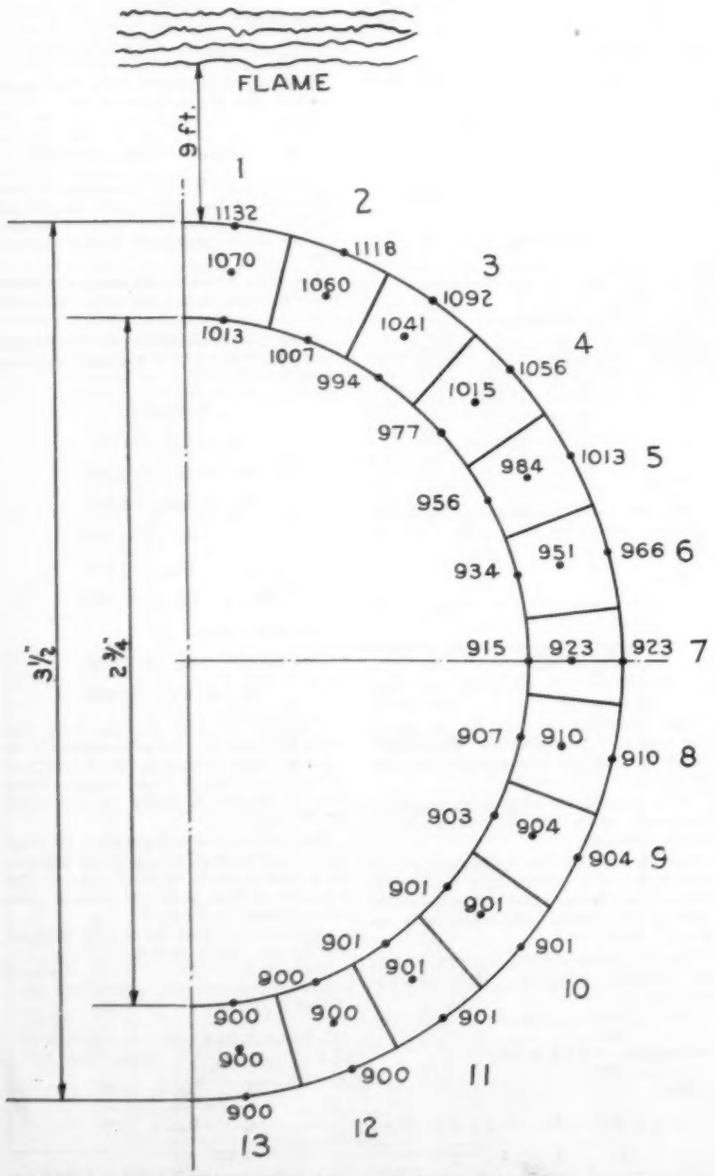



*Fig. 5—Temperature distribution diagram*

# Refinery Welding Must Be RIGHT THE FIRST TIME

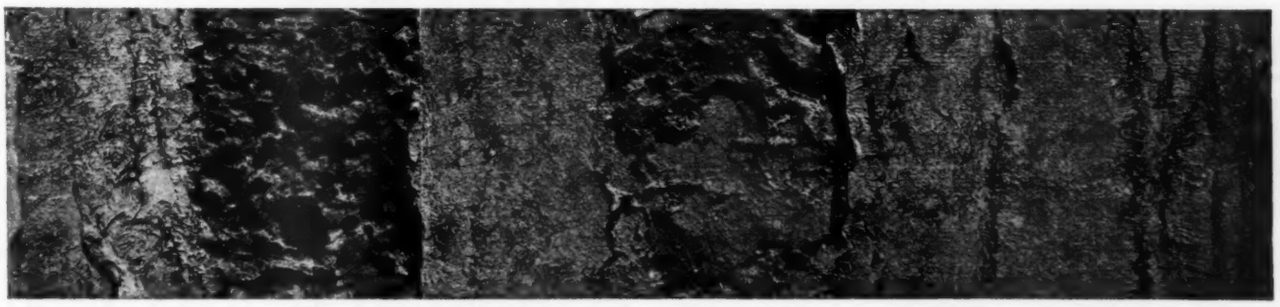
ONCE piping and stills are erected, you can't heat-treat them to strengthen the welds. You can't even test them to see what heat and pressure and chemical reaction will do to them in a year or five years. All you can do is to put them in operation—and hope they're sound.

Obviously the thing to do is to make sure every detail of construction is *right the first time.* It doesn't pay to experiment where lives and property are at stake.

The most skillful welder with the finest welding equipment can't give stainless heat-resisting electrodes qualities the manufacturer *didn't put into them.* Seven kinds of welding rod will look alike in the rod—even on the finished welds. It's what happens to them afterward that counts for you.

## LOOK AT THIS TEST OF 7 WELL KNOWN BRANDS OF STAINLESS ELECTRODES

It was made by engineers of one of the most important refineries in the United States—not by us. The unretouched photograph tells the story. These 7 different stainless welds were laid down on a single piece of stainless steel bar. Without being treated in any way, the sample was then run through a series of acid baths. You can see for yourself how they stood the attack, which had corrosion resistance and which didn't.



NO. 1 AVERAGE FLOWING QUALITY, SLIGHT SPUTTER

NO. 2 GOOD FLOW, PRACTICALLY NO SPUTTER

NO. 3 AVERAGE FLOW, A LITTLE SPUTTER

NO. 4. GOOD FOR FLAT HEAD, SPUTTERS

NO. 5 FLOWS FREELY, VERY LITTLE SPUTTER

NO. 6

NO. 7 FREE FLOW, SPUTTERS

Weld No. 6 was made with a MAURATH Stainless and Heat-Resisting Electrode. It withstood the acid attack without a flaw. That's the answer to your problem. Besides, MAURATH rod lays down easily, flat, vertical or overhead. *It's as free flowing and sputterless as it can be made and still keep its matchless corrosion-proof quality.*

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SEND FOR NEW ALLOY ELECTRODES DATA BOOK

This book contains a wealth of practical Alloy data.

**MAURATH, Inc.**

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**MAURATH**

**Temperature Stresses Produced by Circumferential Temperature Gradient in the Tube**

No known formula in the theory of elasticity covers this case. The following approximate derivation is offered. Suppose that the tube were divided into two halves by a plane through the axis of the tube and parallel to the plane of the flame (see Figure 6). Assume that the temperature distribution in the two halves is the same as in the tube (see Figure 5). The half of the tube which is exposed to the flame will expand diametrically more than the half which is not exposed to the flame.

Let d = the mean diameter of the tube when all the metal is at 900° F. Consider the right hand quadrant of the upper

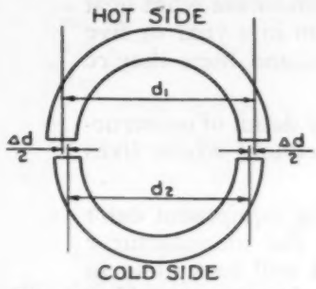


*Fig. 6—Tube section perpendicular to plane of flame*

half of the tube. Let this quadrant be divided into segments the same as in Figure 2. Then the diametrical expansion of the quadrant will be = $\alpha\Delta T \times$ the projection of the quadrant on the diameter. Here $\Delta T$ = mean temperature of the metal minus 900° F.

Call this expansion $\Delta\frac{d_1}{2}$

Then $\Delta\frac{d_1}{2} = \Sigma\, \alpha\Delta T\, l \cos\beta$ $\quad \frac{B_1}{B_7}$

When:

$l$ = mean segment length at 900° F.
$\alpha = 9.72 \times 10^{-6}$ = thermal coefficient of linear expansion.

The summation of the segment expansion is shown in Table 4.

**TABLE 4**

| Segment No. | Cos $\beta$ | $\Delta T$ (°F.) | $\alpha\,\Delta T\, l \cos\beta$ (inches) |
|---|---|---|---|
| 1..... | 0.9928 | 170 | 0.000614 |
| 2..... | 0.9350 | 160 | 0.000544 |
| 3..... | 0.8229 | 141 | 0.000423 |
| 4..... | 0.6631 | 115 | 0.000277 |
| 5..... | 0.4646 | 84 | 0.000140 |
| 6..... | 0.2394 | 51 | 0.000045 |
| 7..... | 0 | 23 | 0 |

$$\Sigma = 0.002044 = \Delta\frac{d_1}{2}$$

In a similar manner $\frac{\Delta d}{2}$ is calculated to be 0.000021 inch. The difference in the expansion of the two quadrants is:

$$\frac{\Delta d}{2} = \frac{\Delta d_1}{2} - \frac{\Delta d_2}{2} = 0.002044 - 0.000021 = 0.00202 \text{ in.}$$

Keeping in mind that the rigidities of the upper and lower halves are equal, suppose that the ends of the two halves were deflected so as to restore the conditions as in the whole tube if the two halves were placed together. The deflection of each end of the upper half inward would equal the deflection of the ends of the lower half outward and in magnitude would be $\frac{\Delta d}{4} = 0.00101$ inch.

The equivalent load, P, per inch of axial length to produce this deflection is given by the equation $P = \frac{4EI}{\pi R^2} \cdot \frac{\Delta d}{4}$.

See Appendix, Part 3.

$$P = \frac{4\times29\times10^6\times0.00439\times0.00101}{\pi\times(1.56)^3} = 43 \text{ lbs.}$$

The maximum bending moment, $M_1$, occurs at Section a–a.

$M_1 = PR = 43 \times 1.56 = 67.2$ inch lbs.

See Appendix, Part 3.

Now applying curved beam formula:

$$(\sigma_t)_{max.} = -\frac{M_1 h_1}{Aea}; \quad (\sigma_t)_{min.} = +\frac{M_1 h_2}{Aeb}$$

Here:

$h_1$ = distance from inner fiber to neutral axis—inches.
$h_2$ = distance from outer fiber to neutral axis—inches.
e = shift in neutral axis in curve beam—inches. See Appendix, Part 3.
A = area of the cross section of beam—sq. in.

$$(\sigma_t)_{max.} = -\frac{67.2\times0.18}{0.375\times0.0075\times1.375} = -3{,}120 \text{ lbs./sq. in.}$$

$$(\sigma_t)_{min.} = \frac{67.2\times0.195}{0.375\times0.0075\times1.75} = +2{,}660 \text{ lbs./sq. in.}$$

Uniform compressive stress on Section a–a $= \frac{43}{0.375} = -115$ lbs./sq. in.

Net $(\sigma_t)_{max} = -3{,}120 - 115 = -3{,}235$ lbs./sq. in.

$(\sigma_t)_{min} = +2{,}660 - 115 = +2{,}545$ lbs./sq. in.

**Conclusions**

An entire analysis similar to the above was run on the carbon steel tube. A comparison of the calculated stresses in the two cases is shown in Table 5.

**TABLE 5**

| | KA2S tube (lbs./sq. in.) | Carbon steel tube (lbs./sq. in.) |
|---|---|---|
| Pressure stress inside | +4,230 | +4,390 |
| Pressure stress outside | +3,230 | +3,490 |
| Radial temp. stress inside | +24,600 | +14,400 |
| Radial temp. stress outside | —22,400 | —12,950 |
| Circum. temp. stress inside | —3,235 | —3,710 |
| Circum. temp. stress outside | +2,145 | +3,000 |
| Total temp. stress inside | +21,365 | +10,690 |
| Total temp. stress outside | —20,250 | —9,950 |

The carbon steel tube failed after 6,000 hours service. The creep stress for 1 per cent deformation in 6,000 hours at 1,000° F. = 5,400 lbs./sq. in. The temperature at the inside of the tube was a maximum of 1,000° F.

Evidently a stress of 5,400 lbs./sq. in. was reached in the tube at the critical point at the inside of the tube.

Then 4,800 — the pressure stress = apparent temperature stress. 4,800 — 3,710 = 1,000 lbs./sq. in.

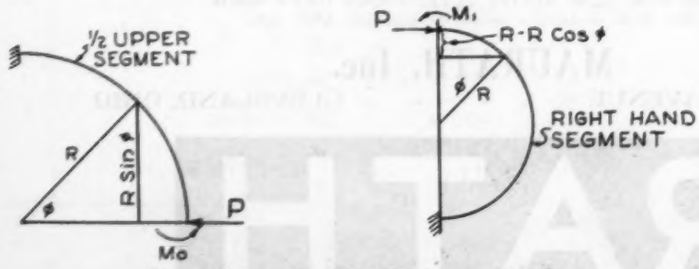


*Fig. 7—Schematic diagrams of curved beams*

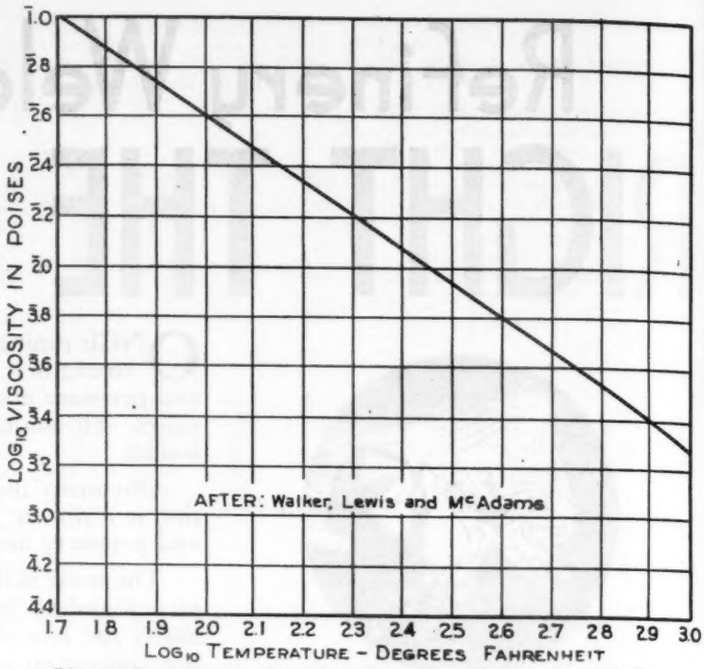


*Fig. 8—Logarithmic viscosity-temperature diagram for 39° Be. Gulf Coast oil*

This apparent temperature stress is approximately 10 per cent of the calculated stress of 16,690 lbs./sq. in. In view of the fact that the creep stress for a given class of metal varies 20 per cent, little weight can be given to the temperature stresses.

In the KA2S tube the maximum pressure stress is 4,230 lbs./sq. in. Even with the addition of 10 per cent of the calculated temperature stress (2,136 lbs./sq. in.) the total stress of 6,366 lbs./sq. in. is far below the creep stress for 1 per cent deformation in 100,000 hours (11.4 years) of service. Such a creep stress for KA2S at 1,000° F. averages 14,500 lbs./sq. in. This fact, coupled with an excellent resistance to corrosion, makes this metal one of the best obtainable for this class service.

In the event that the temperature stresses are disregarded entirely, the determination of a creep stress to produce 1 per cent deformation in the calculated life of the tube is necessary for design purposes. The maximum temperature at which creep occurs is found in the temperature distribution diagram. In this case the pressure stresses must lie below the creep stress just determined. Thus the temperature distribution diagram becomes the controlling factor in the design of a high pressure tube.

## APPENDIX

### Part 1

**Determination of the Viscosity of the Oil at 900° F.**

Viscosity of the oil at 100° F. = 0.04 poises.

$\text{Log}_{10}$ 900 = 2.954.

See Figure 8.

The corresponding $\log_{10}$ viscosity = 3.34.

Viscosity at 900° F. = 0.0022 poises.

Taken from Walker, Lewis and McAdams' "Principles of Chemical Engineering."

### Part 2

**Determination of the Conductivity of Oil Film**

See Figure 9. For any known value of $\frac{DG}{\mu}$, a corresponding value of $\frac{hD/k}{(c\mu/k)^{0.4}}$ may be read from the chart, and h for the oil film may be calculated as all other figures in the expression are known.

### Part 3

**Derivation of Formula for Curved Beam**

Castigliano's theorem will be used in the following derivation.

Figure 7 represents a schematic diagram of a curved beam. The beam is composed of a uniform section cut from a quadrant of the hot side of the tube, one boundary of the quadrant being parallel to the plane of the flame.

The energy of deformation of the beam $= V\int_0^{\pi/2} \frac{M^2 R\, d\theta}{2EI}$

Here $M = PR \sin\phi - M_o$ for any point on the beam.

$$\frac{\partial M}{\partial P} = R \sin\phi$$

The deflection of the end of the beam = $\delta$.

$$\delta = \frac{\partial V}{\partial P} = \frac{R}{EI}\int_0^{\pi/2} \frac{2M(\partial M/\partial P)d\phi}{2}$$

$$\delta = \frac{R^2}{EI}\int_0^{\pi/2} (PR\sin^2\phi - M_o \sin\phi)\, d\phi =$$

$$\frac{R^2}{EI}\left[PR(1/2\phi - \tfrac{1}{4}\sin 2\phi) + M_o\cos\phi\right]_0^{\pi/2}$$

$$\delta = \frac{R^2}{EI}\left[\frac{PR}{4} - M_o\right]$$

$$\text{and } M_o = \frac{PR\,\pi}{4} - \frac{EI\,\delta}{R^2} \qquad (a)$$

Figure 7 is a schematic diagram of a semicircular curved beam. The tube was cut by a plane passing through the axis of the tube and perpendicular to the plane of the flame. A unit axial length is considered.

Here $\frac{\partial V}{\partial M_1}$ = slope at point on tube nearest the flame = 0.

$$\text{Then } \frac{R}{EI}\int_0^{\pi} M\frac{\partial M}{\partial M_1}d\phi = 0$$

$$\text{Now } M = M_1 - P(R - R\cos\phi)$$

$$\text{and } \frac{\partial M}{\partial M_1} = 1$$

Referring to Figure 7, $M_1 = PR - M_o$

$$\text{Then } M = PR\cos\phi - M_o$$

$$\text{and } \frac{R}{EI}\int_0^{\pi}(PR\cos\phi - M_o)d\phi = 0$$

$$= \frac{R}{EI}\left[PR\sin\phi - M_o\phi\right]_0^{\pi}$$

$$= \frac{R}{EI}\left[0 - M_o\pi\right] = 0$$

From which $M_o = 0$.

Substituting in Equation (a), P is given by the equation:

$$P = \frac{4EI}{\pi R^3}\delta$$

Shift of Neutral Axis in a Curved Beam—See Timoshenko's "Strength of Materials."

$$e = \frac{L^2}{12R}\left[1 + \frac{4}{15}\left(\frac{L}{2R}\right)^2\right] = 0.00753$$

inch; where L = depth of beam = ⅜ inch, and R = mean radius = $1\frac{9}{16}$ inches.


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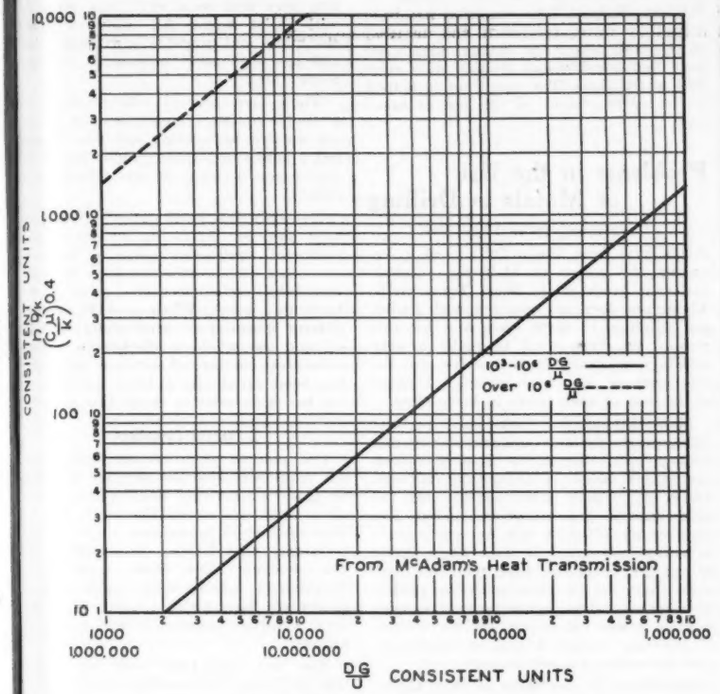



*Fig. 9—Heat flow chart*

## Research of Metallurgist Is Vital in Refinery

(Continued from Page 42)

large subjects of this sort with which we are now particularly interested are (1) the relative suitability of cast equipment as compared with forged equipment (2) the application and desirability of welding as compared with riveting on various types of vessels, and (3) the desirability of welding joints in pipe lines and pipe fittings as compared with screwing them. These three general questions apply to all classes of work and must be considered when the use of alloys is contemplated."

### Sea Water Corrosion

In a refinery along the coast using sea water for condensing water, the following summary of experience is given:

"The principal sources of corrosion are as follows:

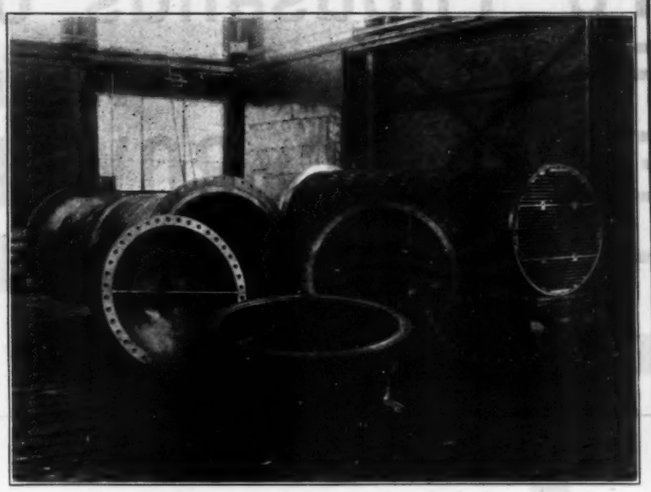
1. Salt water
2. Hydrogen sulphide
3. Sulphuric acid
4. Caustic soda

"Salt water is used for cooling in both tubular condensers and in open coil condenser boxes. The salinity of this water fluctuates between the extreme ranges of totally fresh and sea water, concentration depending upon the season of the year and the precipitation. Tubular condensers are normally fitted with Admiralty metal tubes. Condenser boxes are fitted with cast iron pipe. Pumps have cast iron cases and navy bronze or similar impellers and rings. Admiralty metal has given very good service where the temperature of the outgoing water does not exceed 100°F. At higher temperatures dezincification occurs.

"Hydrogen sulphide is a by-product of cracking. Gases containing this compound have been handled by means of compressors having liners, rods, and valves of 18 per cent chrome, 8 per cent nickel alloy. Aluminum bronze also is resistant to this compound. Where stripping steam is introduced into welded towers severe corrosion occurs at the point of condensation. Where the process permits, injection of caustic soda just ahead of this point is of material assistance.

"Corrosion due to dilute sulphuric acid is overcome by the use of lead lining and, where surfaces come into contact with such a solution only occasionally, cast iron gives fair service. In some cases acid tile cemented with special compounds and cements has been quite satisfactory. Acid sludges are handled through brass pipe with little trouble. Duriron is also resistant to acids of various concentrations.

"Corrosion by caustic soda is combatted by the use of Monel metal and Armco iron. Vessels which might be subject to caustic embrittlement are constructed in such a way as to leave no pockets for the accumulation of caustic and in the

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case of welded vessels these are stress relieved.

"Naphthenic acid corrosion is overcome by the use of bronze and cast steel."

### Natural Gasoline Plants

Natural gasoline manufacturers also witness problems for solution in the realm of metallurgy and one gasoline plant executive summarizes his experiences in the following statement: "We use a 4 × 20 foot steel tank in which sodium hypochlorite and natural gasoline are brought in intimate contact. The life of these tanks is from two to three years. The only economical method of increasing their life has been to specify heavier tanks. In plants where we use indirect reflux, the Admiralty metal or steel tubes have a life of only one year. Atmospheric cooling sections with one inch Admiralty tubes have caused considerable trouble from dezincification in the vicinity of Wichita, Kansas. The condition has been helped by water treatment and aeration of the well water. At several plants we have had considerable trouble with steel feed water lines. The condition is helped by water treatment or the use of brass pipe."

## Problems in the Use of Metals in Drilling

(Continued from Page 38)

sheets have been successfully used in resisting the action of hydrogen sulphide and sour crude oil in West Texas wells. Aluminum does not combine with hydrogen sulphide to form scale and for this reason has been used to make a very satisfactory tank. Its extensive use for this purpose has been retarded because of the cost of such tanks in large sizes.

Many fittings for tanks such as thief hole covers, pressure gauges, valves and fittings and other parts have been used extensively made of aluminum castings. These parts give good service and the light specific gravity of the metal also adds to its efficient use for such parts in many instances. It does not corrode or set up reactions that tend to form scale that will interfere with the proper working of valves, an important consideration where valves are set for release of pressure within tanks or vessels to provide safety against damage.

Aluminum in the form of thin sheets has been used for the coating of tank decks and for wrapping pipe where corrosion of the steel has been excessive when exposed directly to the action of hydrogen sulphide.

Paint made with aluminum dust pigment is also very extensively used in oil fields where atmospheric conditions tend to cause surfaces to rust. In fact aluminum paint is probably used as extensively as any other form of paint in the production department for the metal surface reflects rather than absorbs heat from the sun's rays. This property has been found of considerable advantage in lowering the temperature within storage tanks handling light oils and retarding evaporation.

In many places the use of aluminum pipe is very satisfactory and much of this material has been used in the oil fields. The tendency for cast aluminum fittings to gall in the threads has been reduced by the use of a zinc dust compound when the parts are made up.

Aluminum wire has been found very satisfactory where it is necessary to string electric lines in zones where atmospheric conditions are bad and corrosion of steel wire would be detrimental. This wire weighs less per unit length than copper wire of the same carrying capacity and this is another feature in its favor.

Aluminum tubing has been satisfactory in wells where steel tubing corrodes rapidly. If liners have to be set in wells where corrosion due to sulphur compounds has been destructive of steel tubing it has been found that aluminum perforated pipe can be used and wrapped with aluminum wire with good results.

In rotary drilling it is desirable to use bits that will make the greatest amount of hole before they become blunt. There are many types of bits available and in every type the metallurgist has added many improvements increasing the efficiency of the tool.

In a general way rotary bits fall into two classes, those that grind and those that crush the rocks they penetrate. The bits that tear or crush the formations are called 'fishtails" because of the shape of the tool. There are many modifications of the fishtail bits now available but the principal problem encountered by all makers of this type equipment is to secure a metal that will resist rapid wear of the cutting edges.

As the cutting edge of a bit of this type is relatively small in area compared with the body of the tool it has been found that the bit life can be materially lengthened by surfacing the cutting edge with some very hard alloy that will resist wear. An alloy of cobalt, chromium and tungsten is extremely hard and has been used successfully to "face" rotary bits.

There are several other alloys now available for bit facing and most of them are applied by welding and this industry has reached important proportions in the production division of the petroleum industry.

Not only has hard surfacing materials been used for bit facing but many other pieces of equipment subjected to excessive wear due to abrasion have been protected by surfacing with a coat of this hardening alloy. When a well produced a large quantity of sand along with the oil and the whole is discharged at high velocities cutting of surface equipment has been rapid and a hard surfacing alloy has been used to resist this abrasion.

### Metal Coatings

One method of protecting ferrous metals from corrosion or abrasion has been to apply a relatively thin coating by one of several processes. The idea back of this method of protection is to present a surface that is slow to combine with the elements that cause corrosion or abrasion of iron or steel, much as wood is coated with paint to give it a protective surface against atmospheric conditions.

Zinc has long been used for coating iron and steel. Commercial zinc is known to the trade as spelter and as such contains varying percentages of lead, cadmium and iron. In some instances spelter is used for galvanizing and under such conditions the life of the coating is shortened because the zinc is not pure.

Corrosion is the product of a combination of two or more elements to form a new compound and where one of the elements is taken from fabricated iron or steel the piece of equipment is relatively weakened. The theory back of galvanizing is to provide a less costly element for combination with the elements causing corrosion and by so doing protecting the iron or steel from entering into new alloys or combinations of metals.

To secure the best results pure zinc and plenty of it is one of the essentials to success. It is also very necessary that the coat of zinc be applied so that it will be homogeneous. If the surface to be coated is not properly prepared before the coat of zinc is applied the bond between the zinc and the other metal will be poor and the coating will flake away. If the bond is good but the coating is full of very minute holes that extend to the surface of the metal to be protected the elements that cause corrosion will enter through these minute pores in the zinc surface and attack the other metal beneath.

It is possible to apply zinc by spraying and in this way build up as thick a coat on the surface of the material to be protected as may be desired. The zinc or other metal used for coating by this method is usually very pure and the process used in applying it to the surface of various objects to be protected has been so perfected as to insure a homogeneous coating.

# Service Characteristics of Motor Oils as Related to Chemical Composition

By DAVID R. MERRILL, C. C. MOORE, Jr., and ULRIC B. BRAY
Union Oil Company of California*

(Continued from Page 18, June 6 issue of The Oil and Gas Journal)

The dynamometer tests just described were run under carefully-controlled conditions of continuous operation. Since tests under laboratory conditions do not always agree with results obtained under actual service conditions, a test was made with 20 passenger automobiles and light trucks from the fleet of one of the large public-utility corporations in southern California. These cars were run under routine service conditions of intermittent operation for successive test periods of 1,000 miles, and samples for determination of wear index were taken in the same way as in the dynamometer runs. A run was first made in each car with either of two well-known brands of oil produced by acid treatment of distillate from California low pourpoint crude oil, and then one or more runs were made with a solvent-extracted oil commercially produced from California waxy crude oil. This oil for convenience is referred to hereafter as oil "T." The wear data obtained are shown in Table 4. It will be seen that on the average the western acid-treated oils gave about 70 per cent more wear than did oil "T." Unfortunately, time did not permit extending this fleet test to include the use of typical solvent-treated eastern oils; but, from the similarity of the relationships of the wear indices in these fleet tests to the relationship found in the dynamometer tests, it is probable that such eastern oil would have shown a wear-index value very similar to that obtained with oil "T."

A comparison of the wear-index values obtained in the fleet test and in the motor-dynamometer tests indicates a value over 10 times greater under the fleet-test operation. This is undoubtedly due to the fact that, in the dynamometer tests, the runs were continuous; whereas, in the fleet test, the driving was intermittent and the engines cooled down at intervals in the course of each run. As pointed out by Williams,[5] the greatly increased wear at low engine temperatures, as in starting, appears to be due largely to the condensation, on the cold cylinder walls, of moisture which carries acidity.

The larger amounts of wear found in the fleet test are more comparable with general service experience, as would be expected. For comparison, it may be assumed that the wear occurring in the cylinders in short-run passenger-car service in 40,000 miles is equivalent, in a typical case, to a uniform wear of 0.005 inch of diameter, and that half of the weight of iron removed is from the piston rings and half from the cylinder walls. By calculation, it is found that in a small-sized engine this amount of wear is equivalent to a wear-index value of about 1,400 mg. of iron per 1,000 miles of travel. This figure lies well within the range of values for oil "T" in the fleet test, as given in Table 4. This satisfactory agreement is taken as corroborating the opinion that the method of determining wear by analysis of a lubricating oil gives significant and valuable results.

Since the amount of wear in the fleet test is comparable with service experience, a question might be raised as to the significance of the much smaller wear indices found in the dynamometer test. It will be noted, however, that in both cases the average wear with the western or naphthenic-type oils was about 60 per cent more than with the paraffinic solvent-process oils produced from California waxy crude oil. The constancy of this ratio of wear is believed to indicate that the relative amount of wear under any particular set of operating conditions is significant, but that the absolute values of the wear index may be expected to vary markedly with the size and type of engine and the conditions of service.

### Wear Tests on Prepared Components

Since both the motor-dynamometer and the fleet tests indicated a decided difference between the various oils in their ability to reduce wear, the next step in the investigation was an attempt to identify more definitely the constituents that either caused wear or had a low efficiency in preventing wear. For this purpose, a series of oils of varying paraffinicity was prepared. The oils were not produced from the same lubricating distillate, but rather were produced from similar lubricating distillates of appropriate viscosities, so that all of the oils had about the same viscosity at the crankcase temperature, viz., about 100 sec., Saybolt Universal, at 170° F.

In the case of the least paraffinic fraction, two samples were prepared. One sample, designated as aromatic fraction "AF-1," was an extract produced by sulphur-dioxide treatment of a propane-dewaxed distillate from California waxy crude oil. Because of its very dark color, it was given a moderate treatment with 98 per cent sulphuric acid, neutralized, and clarified by a light contact-clay treatment. The other sample, "AF-2," was produced by application of liquid sulphur-dioxide to a commercial acid-treated western oil from California asphaltic crude oil. The extract obtained was given a light contact-clay treatment, in order to remove any suspended impurities.

The oil next in order of paraffinicity, and referred to as the naphthenic fraction, was prepared as an intermediate extract from a propane-dewaxed distillate from California waxy crude oil. This intermediate extract was produced by extracting, with sulphur dioxide and benzene, a dewaxed distillate which already had been treated with liqiud sulphur dioxide to remove the compounds of very low paraffinicity. The intermediate extract was given a light treatment with 80 per cent sulphuric acid, neutralized, and contact-clay treated.

The fraction representing a paraffinic lubricating oil was the commercially produced solvent-extracted oil of appropriate viscosity from California waxy crude oil, referred to previously as oil "T." For comparison, a solvent-extracted eastern oil was prepared by treatment of a commercial Pennsylvania oil with sulphur dioxide under conditions causing the removal of about 6 per cent of 11.3-A.P.I. extract of a very low degree of paraffinicity, as shown by its viscosity-gravity constant of 0.944.

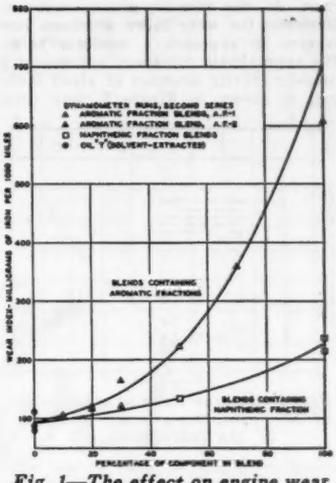
DYNAMOMETER RUNS, SECOND SERIES
A AROMATIC FRACTION BLENDS, A.F.-1
A AROMATIC FRACTION BLENDS, A.F.-2
□ NAPHTHENIC FRACTION BLENDS
● OIL "T" (SOLVENT-EXTRACTED)
BLENDS CONTAINING AROMATIC FRACTIONS
BLENDS CONTAINING NAPHTHENIC FRACTION
PERCENTAGE OF COMPONENT IN BLEND

*Fig. 1—The effect on engine wear of aromatic and naphthenic fractions in blends with oil "T"*

As an example of a hydrocarbon mixture of the highest degree of paraffinicity, a commercial petrolatum of low oil content was employed. The choice of a wax of this character was necessary in order to obtain material of comparable viscosity at the crankcase temperature.

The results obtained when using these various oil constituents in the dynamometer test engine are shown in Table 5. A different engine and slightly different operating conditions were used in this series of runs; and the results are, therefore, not directly comparable with those of the first dynamometer series. In the case of the aromatic fraction, the first run gave such an exceedingly high wear index, and the general condition of the motor was so bad that it was considered desirable to examine the effect of this material in detail. The solvent-process oil (oil "T") from California waxy petroleum was found by analytical solvent fractionation to contain no detectable amount of the aromatic fractions and was, therefore, used as a base stock to which various percentages of the aromatic fractions were added. In the tests on these blends, the wear index increased in proportion to the percentage of aromatic fractions present. The general form of this relationship is shown in Figure 1. At lower concentrations, the increase in wear-index value with increase in aromatic-fraction content is relatively moderate as compared with the very rapid increase in wear-index value over the higher range. The blends produced from the aromatic fractions from the two types of California crude oil had similar effects on engine wear. The similarity of the aromatic fractions from the two sources is also evident from the inspection tests.

In studying the effect of the naphthenic fraction, oil "T" was again used as the base stock in preparing an intermediate blend. As shown in Figure 1, the naphthenic fraction is not so effective as a lubricant as the paraffinic fractions—although it is greatly superior to the aromatic fractions.

In the tests with the wax it was necessary, of course, to melt the material before adding it to the engine, and to keep the crankcase at the full operating temperature during the course of the run. Aside from the fact that the physical characteristics of wax are such that it cannot be used conveniently as a lubricant under normal conditions, the test results indicate that it has good lubricating properties.

### Observed Wear and Composition

Although sufficient work has not yet been done to establish the relationship conclusively, the present results indicate that the lubricating value, as shown by the wear index, is closely related to the paraffinicity of the oil as expressed conveniently by the viscosity-gravity con-

*Author's title, "Service Characteristics of Motor Oils as Related to Composition." Presented at mid-year meeting, A.P.I., Tulsa.

TABLE 4—RESULTS OF THE FLEET TEST TO COMPARE WEAR WITH OILS "W-2" AND "W-3" AGAINST OIL "T-1"

| Car make and number | Wear index, milligrams of iron per 1,000 miles: Oil W-2 | Oil W-3 | Oil T-1: First 1,000 miles | Oil T-1: Second 1,000 miles | Average, Oil W-2 | Average, Oil W-3 | Average, Oil T-1 | Relative Wear index* (per cent) | Relative wear index for each make (per cent) | Relative wear index for all cars (per cent) |
|---|---|---|---|---|---|---|---|---|---|---|
| Make A No. 1 | 1,492 | .... | 1,035 | .... | .... | .... | .... | 144 | ... | ... |
| No. 2 | 2,700 | .... | 1,252 | 1,189 | .... | .... | .... | 227 | ... | ... |
| No. 3 | 1,196 | .... | 854 | 908 | .... | .... | .... | 136 | ... | ... |
| No. 4 | 1,167 | .... | 941 | ... | 2,164 | 6,475 | 1,503 | 124 | | ... |
| No. 5† | .... | 6,475 | 3,525 | .... | .... | .... | .... | 184 | 164 | ... |
| No. 6 | 1,858 | .... | 1,656 | .... | .... | .... | .... | 112 | ... | ... |
| No. 7 | 2,013 | .... | 962 | .... | .... | .... | .... | 209 | ... | ... |
| No. 8 | 4,700 | .... | 3,070 | .... | .... | .... | .... | 153 | ... | ... |
| No. 9 | 2,120 | .... | 1,144 | .... | .... | .... | .... | 185 | ... | ... |
| Make B No. 1† | .... | 2,139 | 2,329 | 1,687 | .... | .... | .... | 106 | ... | ... |
| No. 2 | .... | 3,015 | 1,915 | .... | .... | 2,461 | 2,299 | 157 | 110 | 171 |
| No. 3 | .... | 2,200 | 3,265 | .... | .... | .... | .... | 267 | ... | ... |
| Make C No. 1 | 3,255 | .... | 2,135 | 2,050 | .... | .... | .... | 155 | ... | ... |
| No. 2 | 2,685 | .... | 1,030 | 1,270 | .... | .... | .... | 233 | ... | ... |
| No. 3 | 2,270 | .... | 1,775 | 1,725 | 3,681 | .... | 1,737 | 130 | 201 | ... |
| No. 4 | 7,680 | .... | 2,460 | .... | .... | .... | .... | 312 | ... | ... |
| No. 5 | 2,513 | .... | 1,453 | .... | .... | .... | .... | 173 | ... | ... |
| Make D No. 1 | .... | 1,189 | 567 | 636 | 1,379 | .... | 734 | 198 | 189 | ... |
| No. 2 | .... | 1,570 | 932 | 803 | .... | .... | .... | 181 | ... | ... |
| Make E No. 1 | .... | 1,653 | 718 | 659 | .... | 1,653 | 688 | 240 | 240 | ... |

* $\frac{\text{Wear index of test oil}}{\text{Wear index of reference oil}} \times 100$. Oil "T-1" was used as the reference oil.

†One and one-half ton truck.

‡Although at variance with the other results, this figure has been included in the averages.

Make A is a small six-cylinder car. Make B is a small eight-cylinder car. Make C is a small four-cylinder car. Make D is a small six-cylinder car. Make E is a small six-cylinder car.

stant. As the viscosity-gravity constant decreases, the wear index decreases and appears to approach a constant value. The approximate constancy appears at a viscosity-gravity constant of about 0.810 and, as shown in Figure 2, very little

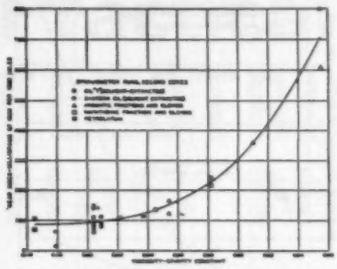

*Fig. 2—Engine wear as a function of the viscosity-gravity constant of the lubricating oil*

further reduction in wear occurs with the use of oils having viscosity-gravity constants below this value.

In connection with this observed relationship between rate of wear and paraffinicity, the recent work of Dover and Hensley[4] is of interest. They have shown that the coefficient of dynamic friction of a certain aromatic compound, di-metatolyl ethane, is over twice that of a paraffinic hydrocarbon of generally similar physical properties, normal octadecane. The viscosity-gravity constants of these two compounds have been calculated to be 0.972 and 0.773, respectively, using the revised formula for low-viscosity oils, developed in this laboratory.[1] Although this work of Dover and Hensley pointed towards lubricating value, expressed in their case as coefficient of dynamic friction, as being a function of paraffinicity, it seemed desirable to investigate the possibility that the variation in observed wear might be due, in part at least, to some other factor, such as development of acidity or to differences in sulphur content.

An attempt to develop a relationship between the wear indices and the acid content of the used oils was unsuccessful when the comparison was made with neutralization numbers determined by the A.S.T.M. methods for either uncompounded or compounded oils. The difficulty in applying these methods to the analysis of dark-colored oils may have tended to obscure a relationship, but it seems doubtful in any case whether corrosion from such acidity could have been a major factor in the observed wear, in view of the limited amounts of acids formed and the low activity of such acids. Because of the uncertainty of the results, as well as their apparent lack of significance, the values have not been included in the tables.

The possibility of a relationship between the wear index and sulphur content was suggested by experience with the use of sulphur in various forms in extreme-pressure lubricants. It is well known that one difficulty in using many effective extreme-pressure bases, including some sulphurized compounds, has been excessive wear. The theory is commonly held that the effectiveness of an extreme-pressure lubricant is due to formation under such conditions of service of a film of corrosion products which prevents seizure from metal-to-metal contact. In view of this, the question may be raised as to whether such high wear is not a normal accompaniment of great effectiveness in raising the film strength under extreme-pressure conditions.

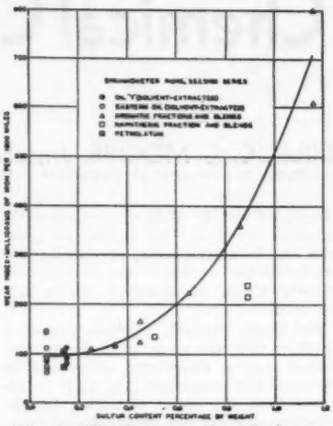

*Fig. 3—Engine wear in relation to the sulphur content of the lubricating oil*

When tested in an extreme-pressure testing device, the aromatic fractions were, in fact, found to have a relatively high film strength, as would be expected from their sulphur content. On plotting the wear indices of the various blends of aromatic and naphthenic fractions against the sulphur content of these blends, results as shown in Figure 3 were obtained. Although the values for the blends containing aromatic fractions appear to indicate a relationship between wear and sulphur content, the validity of this relationship is brought into question by the marked deviation of the naphthenic blends from the curve. It is possible that this deviation is due to differences in the activity of sulphur in different forms of combination, but it appears much more probable that it is the low paraffinicity of the aromatic fractions, rather than the sulphur content, which is responsible for the poor lubricating value of these fractions.

### Approximate Composition

In Figure 4 the results are shown of solvent fractionation of the several prepared components, as well as for most of the commercial oils used in the investigation. The viscosity-gravity constant is taken as the most useful index of composition for the present purpose, because it is much more nearly an additive function than is viscosity index, for example. It has the further advantage of being a valid index of paraffinicity over a very wide range of molecular weight, viscosity, or boiling point. From a study of Figure 4, it is at once evident that the naphthenic fraction, which is very similar in composition to the typical sulphur-dioxide-treated western oil "W-1" shows considerable overlapping of the aromatic and paraffinic fractions in its composition. Without more complete knowledge of the chemical composition of the hydrocarbons composing lubricating oils, it is not possible to establish a chemically-correct classification. The division into aromatic, naphthenic, and paraffinic fractions is, however, a very useful one; and it is also convenient to establish arbitrary points of division in terms of viscosity-gravity constant between these three groups of hydrocarbons. Based on the examination of various samples of extract produced by the use of sulphur dioxide under conditions of good fractionation, a viscosity-gravity constant of about 0.91 is chosen as the approximate dividing point between the aromatic fractions and the naphthenes. Also, from examination of solvent-extracted oils produced under conditions of good fractionation from California dewaxed lubricating distillates, it appears that the division point between paraffinic fractions — representing the major component of a paraffin-base lubricating oil—and naphthenic fractions—representing the major components of a naphthene-base or asphaltic-base lubricating oil—should lie somewhere between 0.83 and 0.87 viscosity-gravity constant. For the present purpose, 0.86 viscosity-gravity constant has been arbitrarily chosen as the dividing point.

It may be seen from the fractionation curves that the aromatic-fraction sample contained only about 10 per cent of naphthenic constituents, as defined by these arbitrary cutting points; and the paraffinic oil contained no aromatic or naphthenic constituents. The naphthenic fraction, however, contained about 25 per cent of material of higher viscosity-grav-

**TABLE 5—WEAR CHARACTERISTICS OF VARIOUS OIL COMPONENTS IN SECOND SERIES OF DYNAMOMETER RUNS**

(Runs made on a small six-cylinder engine operating under constant load and speed equivalent to 40 m.p.h. road travel, but with the throttle closed momentarily every 20 min.)

| | | Characteristics of original oils | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Lubricant— | Run No. | V.I. | Viscosity-gravity constant | Indiana oxidation test (time for 10 Mg. sludge) (hrs.) | Indiana Ppt. No. of used oil (milligrams per 10 G.) | Wear index (milligrams of iron per 1,000 miles) | Average wear index | Relative wear index* (pct.) |
| Oil E-3 | 1 | 106 | 0.804 | 222 | 13 | 141 | | |
| | 3 | ... | ..... | ... | 11 | 86 | | |
| | 8 | ... | ..... | ... | 8 | 75 | | |
| | 13 | ... | ..... | ... | 12 | 83 | | |
| | 16 | ... | ..... | ... | 20 | 141 | | |
| | 19 | ... | ..... | ... | 18 | 94 | 101 | 100 |
| | 20 | ... | ..... | ... | 5 | 61 | | |
| | 22 | ... | ..... | ... | 7 | 111 | | |
| | 24 | ... | ..... | ... | 4 | 89 | | |
| | 27 | ... | ..... | ... | 6 | 147 | | |
| | 28 | ... | ..... | ... | 3 | 70 | | |
| Oil T | 2 | 90 | 0.869 | 91 | 10 | 112 | | |
| | 7 | ... | ..... | ... | 17 | 80 | 94 | 93 |
| | 10 | ... | ..... | ... | 15 | 89 | | |
| AF-2 | 4 | —117 | 0.955 | 3 | ... | 800 } | | |
| AF-2 | 18 | ... | ..... | ... | 254 | 608 } | 704 | 697 |
| Oil T+10 per cent AF-2 | 21 | 82 | 0.822 | 11 | 40 | 110 | 110 | 109 |
| Oil T+20 per cent AF-2 | 23 | 71 | 0.837 | 5 | 53 | 120 } | | |
| Oil T+20 per cent AF-2 | 25 | ... | ..... | ... | 56 | 116 } | 118 | 117 |
| Oil T+30 per cent AF-2 | 17 | 65 | 0.854 | 4 | 90 | 166 } | | |
| Oil T+30 per cent AF-2 | 26 | ... | ..... | ... | 82 | 123 } | 145 | 144 |
| Oil T+50 per cent AF-1 | 30 | 32 | 0.881 | 4 | 69 | 222 | 222 | 220 |
| Oil T+70 per cent AF-2 | 15 | —10 | 0.910 | 3 | 221 | 360 | 360 | 356 |
| Naphthenic fraction | 9 | 22 | 0.882 | 19 | 47 | 216 } | | |
| Naphthenic fraction | 12 | ... | ..... | ... | 70 | 238 } | 227 | 225 |
| Oil T+50 per cent naphtha | 29 | 63 | 0.844 | 15 | 20 | 135 | 135 | 134 |
| Wax | 11 | ... | 0.765 | ... | ... | 73 } | | |
| | 14 | ... | ..... | ... | ... | 106 } | 89 | 88 |

* $\frac{\text{Wear index of test oil}}{\text{Wear index of reference oil}} \times 100$. Oil "E-3" was used as reference oil in this series.

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ity constant than 0.91 and about 30 per cent of material of lower viscosity-gravity constant than 0.86. That the 25 per cent of material of high viscosity-gravity constant was not alone responsible for the high wear index shown by the naphthenic fraction is indicated by the fact that this wear index is about the same as the wear index of a 50 per cent blend of the aromatic fraction with oil "T." Since the effect of the aromatic constituents is undoubtedly offset to some extent by the paraffinic constituents also present, it is believed that the wear index actually found for the naphthenic fraction can be taken as an approximation to that for a naphthenic fraction lying substantially within the arbitrary limits of viscosity-gravity constant.

On examining the fractionation curves for the commercial oils, it may be readily seen that this method of analysis gives valuable information on the composition of the oils. Thus oil "T" is shown to lie entirely in the range of viscosity-gravity constants less than 0.86 and to contain no aromatic or naphthenic fractions as arbitrarily defined; and the solvent-treated Pennsylvania oil is shown to contain no aromatic fractions and only 8 per cent of naphthenic fractions. Since the wear index of the naphthenic component was found to be roughly twice that of the paraffinic oil "T," the effect of the naphthenic material in the limited proportion present in this solvent-extracted eastern oil would be expected to be relatively small. The two commercial eastern oils produced by conventional methods without the use of solvent extraction are shown to contain about 5 per cent of material lying in the aromatic range, and also about 10 per cent of material in the naphthenic range. In view of the results of tests on the blends of aromatic and naphthenic fractions with oil "T," the conclusion seems well justified that the removal, by solvent extraction, of the aromatic components, together with a part or all of the naphthenic components, results in improvement, rather than reduction, in lubricating value. The solvent-fractionation curves of the sulphur-dioxide-treated western oil "W-1" and the acid-treated western oil "W-3" are of interest. It is seen that, particularly in the case of the acid-treated oil, relatively large amounts of aromatic material are present; and it would, therefore, be expected that such oils would show high rates of wear in comparison with highly purified paraffinic oils. This is in accordance with actual findings in both the dynamometer and fleet tests.

### Oxidation Resistance

For satisfactory performance, it is obviously necessary that a motor oil not only have desirable characteristics when new, but also that it retain these characteristics in service. One of the most important factors causing deterioration in service is oxidation; and resistance towards oxidation is, therefore, a very desirable characteristic. The effectiveness of solvent treatment in increasing the resistance of lubricating oils towards oxidation is well recognized, and in the present work an attempt was made to relate oxidation stability more definitely to composition. Deterioration of a lubricating oil by oxidation may be readily followed by the increase in sludge content, carbon residue, viscosity, and acidity. In the Indiana oxidation test, chief reliance is placed upon a gravimetric-precipitation test for determination of sludge content, and upon viscosity increase—although the neutralization value may also be followed.

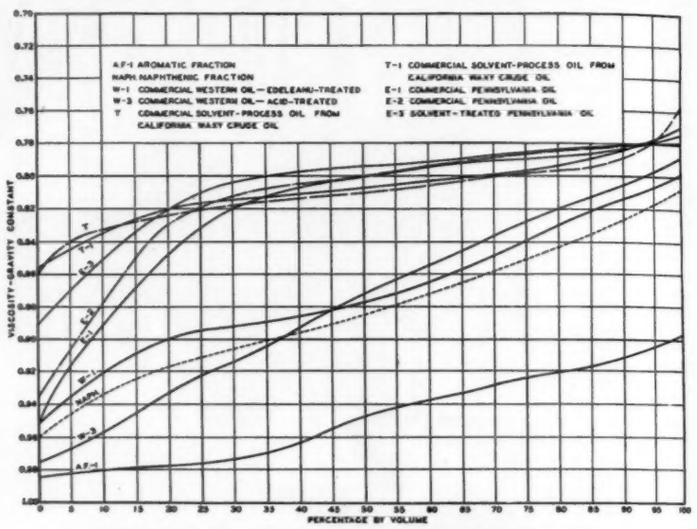
AF-1 AROMATIC FRACTION
NAPH. NAPHTHENIC FRACTION
W-1 COMMERCIAL WESTERN OIL—EDELEANU-TREATED
W-3 COMMERCIAL WESTERN OIL—ACID-TREATED
T COMMERCIAL SOLVENT-PROCESS OIL FROM CALIFORNIA WAXY CRUDE OIL
T-1 COMMERCIAL SOLVENT-PROCESS OIL FROM CALIFORNIA WAXY CRUDE OIL
E-1 COMMERCIAL PENNSYLVANIA OIL
E-2 COMMERCIAL PENNSYLVANIA OIL
E-3 SOLVENT-TREATED PENNSYLVANIA OIL
VISCOSITY-GRAVITY CONSTANT
PERCENTAGE BY VOLUME

*Fig. 4—Solvent-fractionation curves of various oils*

Indiana oxidation tests have been run on the various oils used in this investigation, and the results of these tests are given in Table 1. From these results, some interesting conclusions can be drawn. As might be expected, the aromatic fraction "AF-2" has especially poor oxidation stability, as shown both by the short time of three hours required for formation of 10 mg. of sludge per 10-g. sample and the large increase of 122 per cent in the kinematic viscosity at 130° F. after 50 hours of oxidation. It is of particular interest that the addition of only 10 per cent of this material to oil "T" reduced the stability from high value, represented by 91 hours and 3 per cent viscosity increase, to 11 hours and 25 per cent viscosity increase. This may be compared with the results shown for wear index, in which case the addition of 10 per cent of aromatic fractions caused only a moderate increase in the amount of wear. From these results, it may be concluded that the complete removal of material of high viscosity-gravity constant by thorough solvent treatment is particularly desirable from the standpoint of improvement in oxidation stability. This is also shown by a comparison of the Indiana-test results on the solvent-treated eastern oil "E-3" with a corresponding eastern oil "E-2" which had not been solvent-treated. It is seen that the removal of about 6 per cent of low-grade material raised the time required for formation of 10 mg. of sludge from 54 to 222 hours, but had no appreciable effect on the viscosity increase—which was about 20 per cent in 50 hours.

A comparison between the solvent-extracted eastern oil "E-3" and the solvent-extracted oil from California waxy crude oil, "T-1," is of interest in showing the differences in oxidation characteristics between oils containing residual stocks and oils composed exclusively of distillates. It is seen that oil "E-3" had a very long life before the formation of 10 mg. of sludge; but that when sludging once started, it proceeded very rapidly, as shown by the short time for the amount of sludge to increase from 10 mg. to 100 mg. With oil "T-1," the time required for formation of 10 mg. of sludge was shorter; but the rate of sludge formation after reaching the 10-mg. point was still very slow, so that over twice as much time was required for formation of 100 mg. as for 10 mg. In consequence the total time required for formation of 100 mg. of sludge was approximately the same for the two oils. A relatively slow on-set of sludge formation in the Indiana test but a rapid formation after it once starts is a common characteristic of highly-treated lubricating oils containing residual stocks, and it is a further characteristic of such oils that the early evidences of deterioration during the progress of the oxidation often take the form of viscosity increases, rather than sludge formation. This is shown in the present instance by the viscosity increase of 19 per cent in 50 hours for oil "E-3," in comparison with an increase of only 4 per cent for oil "T-1" in the same length of time. The statement is made by the originators[8] of the Indiana test that laboratory sludging times well above 70 hours have little significance for comparative purposes, and viscosity change then becomes the primary consideration. It is difficult to evaluate quantitatively the sludging which takes place in a crankcase during service, but inspection of crankcases of engines used in the various road and dynamometer tests has shown that the high stability of the solvent-treated oil "T," indicated in the Indiana test, is actually reflected in service; and that the crankcases, valve chambers, and other places where gummy deposits usually accumulate are, in fact, exceptionally clean when this oil is used.

The data on the neutralization values of the used oils from the various test runs, although not very conclusive, gave some indication of a trend towards lower acid numbers for the oils of lower viscosity-gravity constants; from which it may be concluded that solvent refining, at least if not carried beyond the present limits of about 0.80 viscosity-gravity constant, is advantageous from the standpoint of reducing formation of acidity in service.

(To Be Continued)

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## Many Refinery Problems Must Now Be Solved

(Continued from Page 40)

the charge at the pressure stills and an ammonia addition to the stream at the toppers and rerun units.

The ammonia is particularly effective in our crude and rerun stills where we were previously having some trouble due to rapid corrosion. It also lowered maintenance costs by greatly reducing the insulating deposit in some of the tube

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bundles and allowing us to clean them less frequently.

Tools which are used in our refineries can usually be classified under one of the two different headings, impact and non-impact.

For our impact tools, we have found that what we need is a tool steel which can be treated successfully in our maintenance shops by a blacksmith. The alloy, which we have more or less standardized for this service, is a tough silicon molybdenum steel which is not as sensitive to overheat and correct drawing temperature as the usual high carbon steel.

For non-impact tools, we have not set up a definite standard, and use high carbon, drop forged or cast steel, and chrome molybdenum alloy, according to the service for which the tool is intended. In a few cases, where exceptional toughness is required, we use the silicon molybdenum steel mentioned above. On the other hand, when unusual hardness is desirable, we use a tungsten tool steel with extreme wear-resisting qualities.

## Use of Nickel-Bearing Alloys in Oil Refineries

(Continued from Page 50)

chromium alloy with no nickel. Both alloys will be destroyed if hydrogen sulphide is present and both be equally resistant if the sulphur is in an oxide form.

Attack at 1,800° F. upon heat-resistant alloys will be rapid if hydrogen sulphide contacts the hot metal. The adjusting of the burners is therefore very important since the atmosphere of the fire-box may show excess air due to secondary air, but attack may go on owing to hydrogen sulphide of the fuel striking the hot metal before combustion with secondary air occurs. The attacked metal often shows spots and "sores"; apparently a metal sulphide is first formed that burns later to an oxide.

Ni-Resist cast iron is used for the tube sheet castings where conditions are not severe enough to warrant a more heat-resistant alloy. This alloy cast iron is quite resistant to oxidation at temperatures up to about 1,500° F., and does not tend to grow as does gray cast iron.

Tubes of welded sheets of heat-resistant material of the approximate composition of 20-26 per cent chromium, 12-20 per cent nickel, are used for certain reactions carried out at temperatures of 1,500-1,800° F. There is a growing interest, in refineries, in high-temperature synthesis of materials from refinery gases, and a more general application of welded tubing of chrome-nickel alloys is very probable.


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# California Oil Field Operations for April, 1935

According to the American Petroleum Institute, total production of crude in California for April amounted to 14,174,149 bbls., an average of 472,471 bbls. per day, a decrease of 25,310 bbls. per day under March.

Total stocks of crude and all products in Pacific Coast territory decreased during the month 2,584,404 bbls. The total stocks at the end of the month were 121,660,485 bbls., a decrease of 4,557,832.

Fifty-six wells were completed during the month with an initial daily production of 49,666 bbls.

### CRUDE PETROLEUM PRODUCTION

(Figures of Production and Stocks are in barrels of 42 gallons)

| | Total production, April | Daily average Apr., 1935 | Daily average Mar., 1935 | Daily average Apr., 1934 |
|---|---|---|---|---|
| Group No. 1: | | | | |
| Belridge—North | 181,566 | 6,052 | 6,615 | 6,659 |
| Belridge—South | 75,897 | 2,530 | 2,432 | 2,071 |
| Coalinga | 558,383 | 19,613 | 18,578 | 16,257 |
| Edison | 33,136 | 1,071 | 1,289 | ..... |
| Elk Hills | 232,857 | 7,762 | 7,804 | 10,908 |
| Fruitvale | 106,892 | 3,563 | 3,765 | 3,719 |
| Kern River | 340,563 | 11,352 | 10,700 | 9,294 |
| Kettleman Middle Dome | ..... | ..... | 108 | 221 |
| Kettleman North Dome | 1,587,677 | 52,923 | 65,098 | 55,852 |
| Lost Hills | 148,413 | 4,947 | 4,481 | 3,594 |
| McKittrick | 114,393 | 3,813 | 3,258 | 3,241 |
| Midway-Sunset | 1,622,524 | 54,084 | 51,496 | 54,268 |
| Mountain View | 280,273 | 9,342 | 12,425 | 5,864 |
| Mount Poso | 376,679 | 12,556 | 12,134 | 8,740 |
| Round Mountain | 161,737 | 5,391 | 4,895 | 5,044 |
| Wheeler Ridge | 13,036 | 435 | 439 | 421 |
| Group No. 2: | | | | |
| Capitan | 39,697 | 1,323 | 708 | 341 |
| Elwood | 297,107 | 9,904 | 9,997 | 11,721 |
| Rincon | 32,477 | 1,083 | 1,174 | 1,701 |
| San Miguelito | 12,458 | 415 | 538 | 698 |
| Santa Barbara | 97,121 | 3,237 | 3,381 | 553 |
| Santa Maria | 67,881 | 2,263 | 4,090 | 4,442 |
| Summerland | 1,482 | 49 | 59 | 66 |
| Ventura Avenue | 438,286 | 14,610 | 18,756 | 27,394 |
| Ventura-Newhall | 117,730 | 3,924 | 4,059 | 3,664 |
| Watsonville | 1,800 | 60 | 60 | 60 |
| Group No. 3: | | | | |
| Brea-Olinda | 300,228 | 10,008 | 10,416 | 9,334 |
| Coyote—East | 79,858 | 2,662 | 2,706 | 2,430 |
| Coyote—West | 292,713 | 9,757 | 2,796 | 8,796 |
| Dominguez | 604,681 | 20,156 | 21,145 | 20,496 |
| Huntington Beach | 1,163,609 | 38,787 | 39,581 | 39,682 |
| Inglewood | 322,421 | 10,747 | 10,483 | 9,180 |
| Lawndale | 3,785 | 126 | 142 | 142 |
| Long Beach | 1,956,182 | 65,206 | 65,642 | 66,934 |
| Los Angeles-Salt Lake | 23,463 | 782 | 827 | 756 |
| Montebello | 170,277 | 5,676 | 5,799 | 5,082 |
| Playa Del Rey | 246,611 | 11,554 | 15,860 | 9,711 |
| Potrero | 12,225 | 408 | 366 | 468 |
| Richfield | 230,550 | 7,685 | 8,041 | 7,932 |
| Rosecrans | 85,564 | 2,852 | 2,828 | 2,721 |
| Santa Fe Springs | 1,107,601 | 36,290 | 38,765 | 42,925 |
| Seal Beach | 267,552 | 8,918 | 9,200 | 11,036 |
| Torrance | 207,941 | 6,931 | 6,734 | 6,444 |
| Whittier | 29,823 | 994 | 1,001 | 1,082 |
| Total April | 14,174,149 | 472,471 | 497,781 | 482,426 |
| Total March | 15,431,203 | 497,781 | | |
| Decrease | 1,257,054 | 25,310 | | |

### OIL FIELD DEVELOPMENT

| | New rigs up | Active drilling | Producers completed | Daily initial output | Active producing | Abandoned wells: Drillers | Abandoned wells: Producers |
|---|---|---|---|---|---|---|---|
| Group No. 1: | | | | | | | |
| Belridge—North | 2 | 3 | 1 | 1,258 | 27 | .. | .. |
| Belridge—South | .. | ... | ... | ..... | 129 | .. | .. |
| Coalinga | 2 | 9 | ... | ..... | 995 | .. | .. |
| Edison | 2 | 13 | 3 | 769 | 25 | 2 | .. |
| Elk Hills | .. | ... | ... | ..... | 158 | .. | .. |
| Fruitvale | .. | 2 | 1 | 149 | 69 | .. | .. |
| Kern River | 2 | 4 | 2 | 561 | 1,493 | .. | .. |
| Kettleman Middle Dome | .. | 1 | ... | ..... | ..... | .. | .. |
| Kettleman North Dome | 1 | 24 | ... | ..... | 87 | .. | .. |
| Lost Hills | .. | 1 | ... | ..... | 321 | .. | .. |
| McKittrick | 1 | 1 | ... | ..... | 203 | .. | .. |
| Midway-Sunset | 4 | 7 | 2 | 731 | 2,489 | .. | .. |
| Mountain View | 7 | 17 | 5 | 16,302 | 63 | 1 | .. |
| Mount Poso | 16 | 16 | 6 | 5,851 | 163 | 1 | .. |
| Round Mountain | 2 | 2 | 2 | 1,494 | 52 | .. | .. |
| Wheeler Ridge | .. | .. | ... | ..... | 34 | .. | .. |
| Group No. 2: | | | | | | | |
| Capitan | .. | 2 | ... | ..... | 17 | .. | .. |
| Elwood | 2 | 3 | 1 | 2,713 | 41 | 1 | .. |
| Rincon | .. | .. | 1 | 420 | 30 | .. | .. |
| San Miguelito | .. | 1 | ... | ..... | 2 | .. | .. |
| Santa Barbara | .. | 4 | ... | ..... | 67 | 1 | .. |
| Santa Maria | .. | 3 | 1 | 48 | 181 | 2 | 1 |
| Summerland | .. | .. | ... | ..... | 17 | .. | .. |
| Ventura Avenue | 3 | 8 | 2 | 498 | 154 | .. | .. |
| Ventura-Newhall | 3 | 10 | ... | ..... | 525 | 3 | .. |
| Watsonville | .. | .. | ... | ..... | 7 | .. | .. |
| Group No. 3: | | | | | | | |
| Brea-Olinda | 1 | 1 | ... | ..... | 355 | .. | .. |
| Coyote-East | .. | 1 | ... | ..... | 68 | .. | .. |
| Coyote-West | .. | 3 | ... | ..... | 35 | .. | .. |
| Dominguez | 4 | 5 | ... | ..... | 77 | .. | .. |
| Huntington Beach | 2 | 2 | 2 | 1,360 | 488 | .. | 3 |
| Inglewood | 2 | 5 | 3 | 1,829 | 207 | .. | .. |
| Lawndale | .. | .. | ... | ..... | 6 | .. | .. |
| Long Beach | 36 | 43 | 9 | 2,774 | 1,143 | 1 | 1 |
| Los Angeles-Salt Lake | .. | .. | ... | ..... | 128 | .. | .. |
| Montebello | 2 | 2 | 2 | 165 | 169 | .. | .. |
| Newport | 1 | 1 | ... | ..... | ..... | .. | .. |
| Playa Del Rey | 11 | 24 | 4 | 11,166 | 166 | .. | 1 |
| Potrero | .. | .. | ... | ..... | 12 | .. | .. |
| Richfield | 1 | 1 | ... | ..... | 236 | .. | 1 |
| Rosecrans | .. | 1 | ... | ..... | 70 | .. | .. |
| Santa Fe Springs | 1 | 5 | 5 | 1,460 | 500 | .. | 7 |
| Seal Beach | .. | 2 | ... | ..... | 112 | .. | .. |
| Torrance | .. | .. | 1 | 118 | 476 | .. | 2 |
| Whittier | .. | .. | ... | ..... | 163 | .. | .. |
| Miscellaneous drilling | 6 | 39 | ... | ..... | ..... | 11 | .. |
| Group No. 4: | | | | | | | |
| Buttonwillow Gas Field | .. | .. | ... | ..... | 12 | .. | .. |
| Delano Gas Field | 1 | 2 | ... | ..... | 1 | .. | .. |
| Dudley Ridge Gas Field | 1 | 2 | ... | ..... | 1 | .. | .. |
| Goleta Gas Field | .. | .. | 1 | Gas | ..... | .. | .. |
| Semi-Tropic Gas Field | 1 | 1 | ... | ..... | 1 | .. | .. |
| April | 121 | 370 | 56 | 49,666 | 11,780 | 23 | 15 |
| March | 89 | 227 | 57 | 68,952 | 11,697 | 23 | 14 |
| Increase | 32 | 43 | 1* | 19,286* | 83 | .. | 1 |
| Average for year 1934 | 53 | 196 | 38 | 47,553 | 11,053 | 21 | 17 |
| Average for year 1933 | 30 | 124 | 21 | 22,842 | 9,199 | 14 | 18 |
| Average for year 1932 | 18 | 108 | 15 | 13,069 | 8,928 | 16 | 14 |

* Decrease.

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# The Development of Rotary Drill Pipe

By H. W. GRAHAM
Jones & Laughlin Steel Corp., Pittsburgh, Pa.*

At few places in all the manifold activities of modern industry is there to be found a tool upon which so much depends as upon rotary drill pipe in modern deep-well oil production. Drill pipe is at once a hazard to the well driller and a problem to the steel maker. To drilling crews who struggle turn after turn in fishing for a broken stem, it may seem a rather remote fact that in steel mills thousands of miles away engineers, steel makers, and metallurgists have been engaged for years in a struggle to improve the mechanical and metallurgical features of drill pipe. Such a struggle is, however, on; and it will be continued until a point is reached where drill pipe can be used, under proper operating conditions, for a period of long service, with twist-offs reduced to the point of rare instances.

*Fig. 1—Bessemer steel, butt-welded. Small diameters, ordinary pipe couplings*

**Analysis**

| | Per cent |
|---|---|
| Carbon | .09 |
| Manganese | .35 |
| Phosphorus | .093 |
| Sulphur | .048 |
| Silicon | .025 |

**Properties**

| | |
|---|---|
| Tensile, lbs. per sq. in. | 64,600 |
| Yield, lbs. per sq. in. | 41,400 |
| Elongation, per cent in 8" | 24.2 |
| Reduction, per cent | 55.4 |
| Impact, ft. lbs. | 15 |

### Early History

Before beginning an account of the present-day status of this struggle for better drill pipe, we shall very briefly review the early types of pipe used in this method of drilling. When rotary drilling was originally devised, supposedly the pipe first used was that form of pipe easily available; i.e., some small diameter of welded steel pipe, probably butt-welded, and perhaps of bessemer steel (see Figure 1).

Probably wrought iron was also used in some of the first instances of rotary drilling, or at least we have been so informed (see Figure 2). Very early in working out the rotary method of drilling, the benefits of larger diameters must have been recognized; and the use of such diameters must have extended into the field of lap-welded open-hearth steel (see Figure 3).

The welding method of manufacturing pipe necessitated low-carbon contents, which means that the early rotary drill pipe was of this analysis. When the seamless or piercing method of making pipe was introduced, the low-carbon analysis was at first still adhered to (see Figure 4); but failures in drilling and greater depths of hole brought recognition of the possibilities of the seamless method for making drill pipe of higher carbon content and, consequently, of greater strength (see Figure 5).

Concurrently with this change in analysis and method of manufacture, there was proceeding a development in method of coupling. The primitive types of rotary drill pipe had used ordinary pipe couplings; but, under the necessity of changing bits, the ordinary pipe couplings would not satisfactorily stand up under the necessarily frequent make and break. This led to the introduction of a heavy-duty special coupling that gradually developed into the tool joint of today.

### Later Development

While the tool joint solved the make-and-break problem with some degree of satisfaction, ever-increasing depth of hole and the urge for fast drilling caused other points of weakness to become apparent. One of these was found in the threaded connection of drill pipe to tool joint. In an effort to correct failures at this point, the wall of the drill pipe was upset to a greater thickness to compensate for the depth of metal removed in threading.

*Fig. 2—Wrought-iron, welded. Small diameters. ordinary pipe couplings*

**Analysis**

| | Per cent |
|---|---|
| Carbon | .03 |
| Maganese | .04 |
| Phosphorus | .130 |
| Sulphur | .025 |
| Silicon | .17 |

**Properties**

| | |
|---|---|
| Tensile, lbs. per sq. in. | 49,100 |
| Yield, lbs. per sq. in. | 30,600 |
| Elongation, per cent in 8" | 28.1 |
| Reduction, per cent | 54.0 |
| Impact, ft. lbs. | 35 |

With increasing depths of hole and more severe drilling conditions, there were progressive increases of carbon content of upset drill pipe—with consequent improvement in tensile strength as offered by A.P.I. grades "C" and "D" (see Figures 6 and 7).

While, as a remedy for failures of the threaded connection between drill pipe and tool joint, the upset doubtless appeared entirely satisfactory from the viewpoint of a mechanical engineer, in fact it introduced the first real metallurgical difficulty encountered in the development of rotary drill pipe. The necessarily high temperature used in forging the upset end on the pipe caused grain growth in the upset portion and reduced its strength far below the figure that the composition of the steel should have provided. Furthermore, the local heating of the end of the pipe and the hammering of the upsetting operation introduced a zone of considerable weakness at the junction of the upset and the body of the pipe (see Figure 8).

An effort was made to overcome this condition by normalizing the upset end, but it was not found possible to avoid a sharp change of temperature between the heated and unheated portions of the pipe; and failures continue to occur due to structural weakness at this point. A complete answer to this condition is fortunately to be found in accepting the task of full-length normalizing, and this measure is now generally regarded to be good practice in drill-pipe manufacture. It has obvious merit in putting the finished pipe in substantially uniform structural condition from one end to the other.

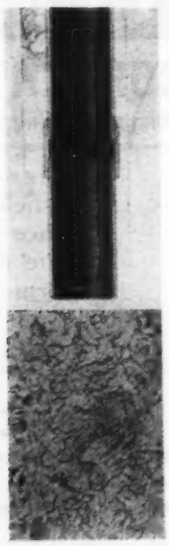


*Fig. 3—Open hearth steel, lap-welded*

**Analysis**

| | Per cent |
|---|---|
| Carbon | .10 |
| Manganese | .36 |
| Phosphorus | .016 |
| Sulphur | .039 |
| Silicon | .015 |

**Properties**

| | |
|---|---|
| Tensile, lbs. per sq. in. | 57,150 |
| Yield, lbs. per sq. in. | 35,200 |
| Elongation, per cent in 8" | 26.8 |
| Reduction, per cent | 62.5 |
| Impact, ft. lbs. | 60 |

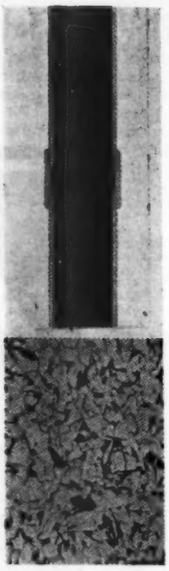


*Fig. 4—Open hearth steel,seamless, low carbon (A.P.I. Grade A). Increasing diameters, ordinary pipe couplings*

**Analysis**

| | Per cent |
|---|---|
| Carbon | .12 |
| Manganese | .43 |
| Phosphorus | .016 |
| Sulphur | .038 |
| Silicon | .025 |

**Properties**

| | |
|---|---|
| Tensile, lbs. per sq. in. | 58,700 |
| Yield, lbs. per sq. in. | 39,100 |
| Elongation, per cent in 2" | 42.8 |
| Reduction, per cent | 62.1 |
| Impact, ft. lbs. | 60 |

Although full-length normalizing does practically eliminate the junction of the pipe and the upset as a zone of pronounced weakness, this improvement has had the effect of again moving the point of most frequent failure to the threaded connection of the pipe to the tool joint.

### Fatigue Failures

Specifically, failures at this point almost always occur at the last-engaged pipe thread; i.e., at the extreme end of the tool joint. In recent years it has become recognized that failures at this point are due to progressive deepening of the notch of the thread under conditions of corrosion fatigue. Obviously, the conditions required to produce failure are always present in drill pipe:

1. There must be a notch, which in this case is the thread.
2. The pipe must be bent, as it almost always is, even if ever so slightly.
3. The pipe must be alternately stressed as must be true of a bent pipe in rotation.
4. There must be present a corrosive liquid. Drilling mud provides this condition, since it contains moisture and some dissolved content of oxygen and other gases.

There is always some jaggedness in the root of a thread cut by even the best threading equipment, and under the above outlined conditions this jaggedness develops into a microscopic crack which works into the wall of the upset until either a wash-out or a twist-off occurs.

Fatigue tests in a laboratory[1] show that drill-pipe materials ordinarily have a fatigue-endurance limit of about 42 per cent to 47 per cent of the ultimate tensile strength (see Figure 9); i.e., theoretically at least, the drill pipe would never fail by fatigue if it were never bent beyond a point representing an outside fiber stress of 45 per cent of its tensile strength.

The work of various investigators, McAdam[2] and others, has, however, shown that the limit above referred to drops sharply in the presence of oxygen-bearing water, salt water, hydrogen sulphide, etc. Westcott[3] has recently shown that on sucker rods the fatigue-endurance limit under corrosive conditions may be as low

*Presented at mid-year meeting, American Petroleum Institute, Tulsa.

as 35 per cent of that shown in ordinary laboratory atmospheric tests. Furthermore, while laboratory tests indicate that there is a true fatigue-endurance limit and that fatigue specimens will rotate indefinitely if not stressed above this limit, there is evidence to indicate that under corrosive conditions no true fatigue endurance exists. In the presence of corrosive liquids the apparent endurance limit drops lower and lower, so that

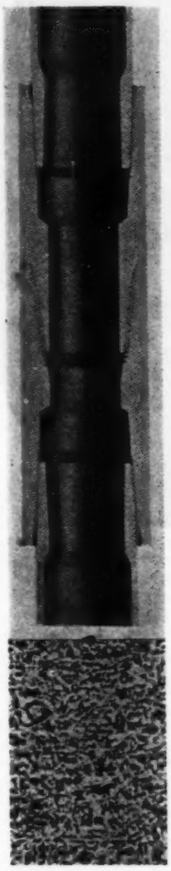


*Fig. 5 — Intermediate seamless (A.P.I. Grade B). Range of diameters, introduction of tool joint*

| Analysis | Per cent |
|---|---|
| Carbon | .23 |
| Manganese | .76 |
| Phosphorus | .016 |
| Sulphur | .026 |
| Silicon | .11 |

| Properties | |
|---|---|
| Tensile, lbs. per sq. in. | 75,900 |
| Yield, lbs. per sq. in. | 49,000 |
| Elongation, per cent in 2" | 38.6 |
| Reduction, per cent | 55.4 |
| Impact, ft. lbs. | 40 |

there does not seem to be any figure of stress at which the specimen will rotate indefinitely.

### Notch Effects

Supplementary to fatigue of drill pipe, there are sharply unfavorable effects introduced by the fact that stresses concentrate about the root of threads in threaded sections. When the drill pipe is bent, the body of the pipe with a smooth exterior acts much like a true beam in deflection, with stresses as shown in Figure 10, sketch 10A. If a notch is present in the convex-bent outer wall, the tensile stresses in the notched section are left unsupported, as shown in sketch 10B. This is, of course, an impossible condition in mechanics; and equilibrium can only be accomplished by the stresses sliding down the wall of the notch, so to speak, to a concentration at the root of the thread as shown in sketch 10C. Mathematical analysis shows that the stress at the root of a notch (thread) may amount to as much as four times that which exists in a member bent to the same degree but not notched. Experimental determinations have shown stress concentrations up to two and a half times the unnotched stress.

This concentration at the root of a notch may be studied to great advantage by the photoelastic method.[4] Based on photoelastic examinations, the stress at the root of a notch is shown more accurately in Figure 11, sketch 11A. In a series of notches, as in a threaded section, where all notches including the end one are of the same size, the concentration in the intermediate notches is somewhat decreased, but the end notches still show (see Figure 11, sketch 11B) almost as concentrated a stress as is the case of a single isolated notch. Where the threaded section is run out gradually in slowly-disappearing threads, the concentration of stress is kept to a minimum as shown in Figure 11, sketch

*Fig. 6—A.P.I. Grade C, seamless. Internal upset, tool joints*

| Analysis | Per cent |
|---|---|
| Carbon | .41 |
| Manganese | .77 |
| Phosphorus | .016 |
| Sulphur | .038 |
| Silicon | .18 |

| Properties | |
|---|---|
| Tensile, lbs. per sq. in. | 90,500 |
| Yield, lbs. per sq. in. | 57,450 |
| Elongation, per cent in 2" | 29.5 |
| Reduction, per cent | 48.9 |
| Impact, ft. lbs. | 20 |

11C. This fact has an obvious application to threaded oil-country goods, particularly drill pipe; and it should be taken into account in the attitude of the field man toward stand-off.

### Combined Effects

In reviewing actual drill pipe in the light of the foregoing discussion, it is further to be borne in mind that in an assembly of non-uniform cross-section, the stresses—when such an assembly is bent—will be most conducive to failure where the more flexible portions are joined to the heavier, more rigid parts. In drill pipe this condition exists at the junction of the body of the pipe with the upset, but a considerable portion of the bending moment is carried through the upset to the last-engaged thread of the drill pipe where the end of the upset is held in the very heavy and almost wholly rigid tool joint (see Figure 12). This thread, therefore, constitutes a very vulnerable point under the combined action of corrosion fatigue and notch effect.

To attempt to visualize this situation in terms of specific figures, let us assume that we are dealing with a drill-pipe material with an ultimate tensile strength of 100,000 pounds per square

*Fig. 7 — A.P.I. Grade D, seamless. Same pipe form as for Grade C seamless*

| Analysis | Per cent |
|---|---|
| Carbon | .44 |
| Manganese | 1.36 |
| Phosphorus | .018 |
| Sulphur | .028 |
| Silicon | .19 |

| Properties | |
|---|---|
| Tensile, lbs. per sq. in. | 107,000 |
| Yield, lbs. per sq. in. | 70,500 |
| Elongation, per cent in 2" | 31.0 |
| Reduction, per cent | 47.0 |
| Impact, ft. lbs. | 39 |

inch, since grade "D" reaches this figure. The dry fatigue-endurance limit would then be about 45,000 pounds per square inch. If corrosive conditions caused a loss of fatigue endurance of 50 per cent, then the corrosive fatigue-endurance limit would be only 22,500 pounds per square inch in the body of the drill pipe. Assuming a stress-concentration factor of two times for a notch, the corrosive fatigue-endurance limit at the root of the last-engaged thread would be only 11,500 pounds per square inch. The figures here shown are based upon the perhaps unjustified assumption that the factors involved are all strictly additive; but even if the factors are not strictly additive, their resultant must, nevertheless, represent a serious loss of strength.

While the figure of 11,500 pounds per square inch seems incredibly low for the operating strength of a material having an ultimate tensile strength of 100,000 pounds per square inch, it is clear that even this strength may not be available. As previously pointed out, various investigators have shown that fatigue strength under corrosive conditions tends to become lower and lower—probably to some figure so low as to offer no operating strength whatsoever. This reasoning appears to offer some explanation as to why a string of drill pipe may age in service to a point where twist-offs are so frequent as to render further useful service impossible.

In viewing the relationship of the above theory and discussion to practical conditions of field operation, it has been our experience that, with carefully-made full-length normalized drill pipe, a very considerable proportion of field failures in drill pipe occurs in the last-engaged thread. It is important, however, to recognize that a goodly percentage of the failures that occur at other points may still be classed as notch failures under conditions of corrosion fatigue. Any surface imperfection which has a general direction at right angles to the axis of the tube may act as a notch and lead to an early failure. Steel-making defects are almost always longitudinal in nature and, therefore, do not act as notches or contribute to failures. Longitudinal markings, such as result from tonging, are of no importance, because they do not result in failures. On the other hand, slip marks—because they are at right angles to the axis of the drill pipe—are very dangerous, and should be kept to a minimum.

A number of cases have come to our attention wherein failures have been caused by cold-stamped identification marks placed on the outside surface of drill pipe. Where a field operator feels that he must have identification marks, we recommend that roman numerals be used instead of arabic (i.e., IV instead of 4) and so placed that the lines of the stamping be approximately parallel to the axis of the tube. In Figure 13 is

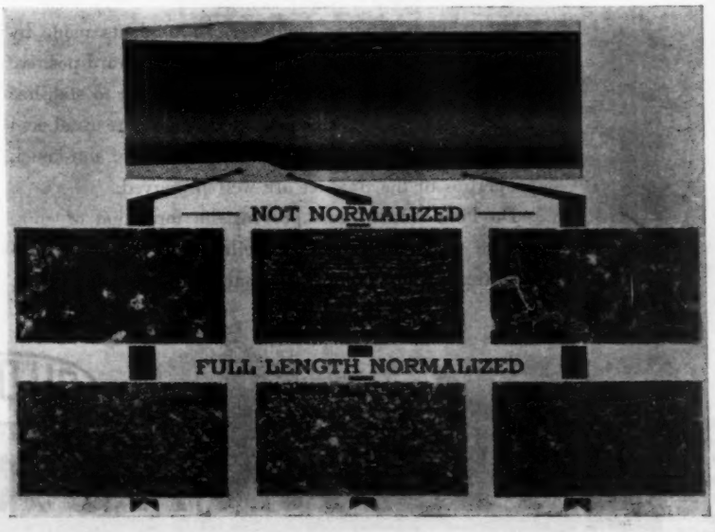
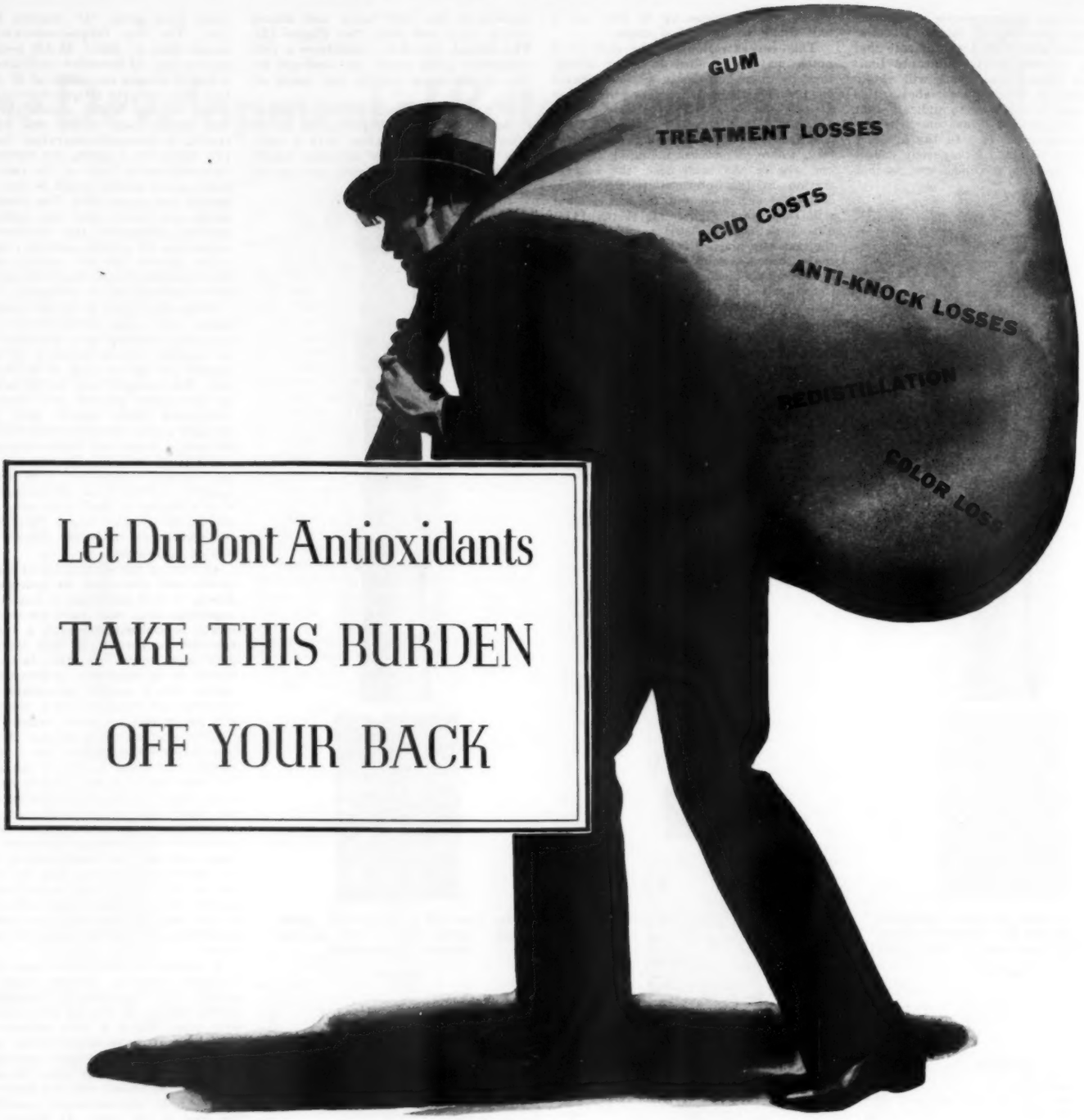



*Fig. 8—Structural problems introduced by upsetting*

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shown a twist-off through the cross-arm of a cold-stamped figure "4".

### Corrective Measures

Returning to the considerable proportion of failures that occurs through the last-engaged drill-pipe thread, let us study the possibility of corrective measures. In the first place, there are measures that can be applied to reduce the corrosive quality of drilling muds, and this subject is well worth whatever study the oil industry can devote to it.

Very early in the discussion of corrective measures, there may well be raised the question as to how much can be accomplished to make a steel metallurgically resistant to notch action, whether corrosive conditions are or are not present. Undoubtedly there are some possibilities in this direction. The subject is being studied, and there is some hope of improved resistance to notch penetration and also of a somewhat higher fatigue-endurance limit. Unfortunately, these two features seem to be rather directly opposed to each other. Steel with a high impact strength dissipates stresses over a wider area and should, therefore, be more resistant to the penetration of a notch. On the other hand, laboratory data indicate that higher fatigue-endurance limits are to be expected from steel with greater ultimate strength and with consequently lower impact strength. A full discussion of this intricate subject is impossible in this brief review. Suffice it to say that there remains much research work to be done before anything very helpful can be expected along this line.

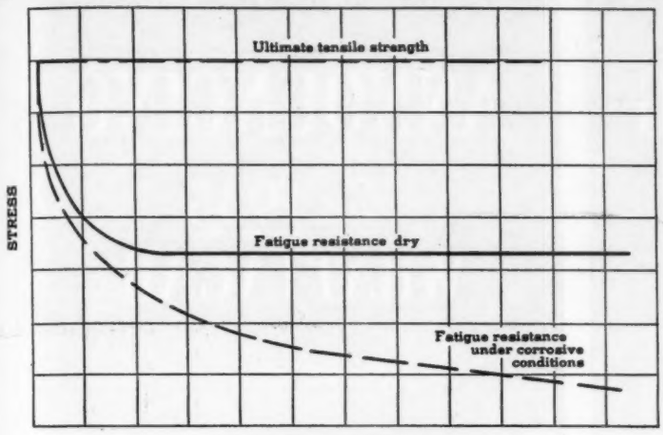



*Fig. 9—Corrosion fatigue resistance*

### Welded Joints

With the metallurgical phases, therefore, as yet unsolved, it remains to be seen what can be done by mechanical means. The first measure in this direction originated in the field. In an effort to prevent wash-outs certain operators adopted the expedient of gas welding the tool joint and drill pipe (see Figure 14, sketch 14A).

This measure accomplishes two things more or less perfectly. It seals the recess between the tool joint and the drill pipe, thereby keeping drilling mud or corrosive mediums away from the threads. The weld is also of sufficient strength to assume some of the stress when the drill pipe is bent in use—thus largely, if not completely, eliminating the notch action of the threads. This measure has, therefore, paid dividends in reduced wash-outs and twist-offs.

Such welding is, however, wrong from two points of view. In the first place, it is not good economics to go to the expense of a precision-threaded joint between drill pipe and tool joint and then weld the threaded joints. Under such conditions one may well ask if the joint could not have been originally welded as a whole, thereby eliminating the cost of the two threading operations.

Furthermore, the supplementary welding job has the disadvantage that it joins the carefully heat-treated tool joint to the drill pipe, leaving the local area around the weld in a weakened metallurgical condition. Obviously, local stress-relieving would do little good, and full-length normalizing is out of the question—because it would seriously affect the heat-treated structure of the tool joint, as well as resulting in considerable damage to the tool-joint thread.

If the elimination of the threaded connection of drill pipe to tool joint were to be eliminated by welding, one of several methods of procedure might be selected. First, it might be decided to provide an already threaded and heat-treated tool joint, with a butt end instead of a pipe thread, and weld it to a butt-end upset on the drill pipe (see Figure 14, sketch 14B). Under such circumstances, it would be difficult to obtain sufficiently good alignment between the short tool joint and the drill pipe. Any misalignment would interfere with proper tool-joint action, and would probably lead to early failures or eccentric wear. Neglecting misalignment and assuming a perfect weld, this procedure would make it impossible to normalize or stress-relieve the weld because of the already heat-treated and threaded tool joint. This would mean the use of a raw weld, over the entire cross-section of the drill pipe. Even if every weld were perfect, the structural conditions adjacent to the weld would certainly be questionable in view of the heavy-duty performance required of drill pipe. Relatively sharp temperature gradients are inescapable in welding; and, consequently, welding without subsequent heat treatment leaves sharp structural variations not suitable for drill-pipe quality. Kinzel[3] has recently presented data on the metallurgical effects of sharp temperature gradients resulting from welding. Incidentally, sharp temperature gradients are likewise the reason, as previously explained, for the necessity for full-length normalizing after end-upsetting drill pipe.

Another method of proceeding to eliminate the threaded connection of drill pipe to tool joint by welding would consist of providing a blank of suitable heavy-wall steel to be welded to the drill pipe and, subsequently, full-length normalized and finally threaded. With perfect or at least 100 per cent acceptable welds, this procedure would largely eliminate misalignment, since threading would be done after the tool-joint blank had been welded to the pipe. The final normalizing heat treatment would correct the effects of temperature gradients existing in the weld, and would satisfy a primary requirement in the manufacture of high-grade drill pipe which may be stated in the following words:

The final heating used in the manufacture of drill pipe should be applied to each length of pipe as a whole.

While the above procedure does accomplish by welding the objective of eliminating the threaded connection of drill pipe and tool joint, it involves one special condition and one assumption. The special condition involved rests in the fact that the blank welded to the drill pipe must be made of a grade of steel that after normalizing will have tool-joint physical properties. This condition can be met as will be subsequently explained. The assumption involved is that all welds can be made of quality adequate to the needs of drill-pipe use. This requirement would appear to require special welding equipment, with a considerable investment cost. Furthermore, this method, if the welds were to be thoroughly depended upon, would involve the use of radiographic or other electrical means for non-destructive inspection of all welds. It would be necessary to go through considerable development work before existing methods of non-destructive inspection could be reduced to a desirably simple and cheap form.

By this discussion it can be readily seen that the difficulties in welding drill pipe to tool joint are of such magnitude as to raise a question as to whether the objective cannot be reached some other way.

### Integral Tool Joint

With the foregoing facts and considerations in mind, the elimination of the threaded joint between drill pipe and tool joint presents the problem of forging an upset end on the pipe, of proper size and shape to act—after heat treating and threading—in the same manner as the conventional tool joint. To accomplish this objective successfully, the drill pipe must be made of such quality that the upset end will be adequate to the requirements of tool-joint service.

A further condition is that, from practical considerations, the steel must lend itself to normalizing operations to produce the required physical properties. If the liquid-quenching operations used for producing high-duty parts in the automotive and other industries were applied to the manufacture of drill pipe, the equipment would be so costly and the operation so expensive that the resulting drill pipe would be absolutely prohibitive in price.

These conditions limit the required steel to a semi-air-hardening grade. Among the air-hardening steels probably the least expensive is to be found in certain manganese-carbon combinations. The ratio of manganese to carbon is critical, but we have found that a combination can be commercially produced suitable to the purpose. With 0.25 per cent carbon, a 2.50 per cent manganese steel has an adequate hardening response to heating and cooling (quenching) in air, with a flexibility that can be controlled by variation of time and temperature to produce a wide variation of physical properties.

With such a grade of steel available commercially, the problem of eliminating the threaded joint between drill pipe and tool joint resolves itself into upsetting the end of the pipe to a tool-joint shape and cutting a tool-joint thread thereon. Such procedure provides a tool joint integral with the drill pipe itself (see Figure 15).

After the upsetting operation, the drill pipe—not yet threaded—can be heat-treated by as many operations as may be required to produce the desired physicals. Furthermore, the heavy wall of the upset which is to form the tool joint can be so treated as to increase its hardness and strength against wear and stabbing action as compared to the body of the pipe where ductility and impact resist-

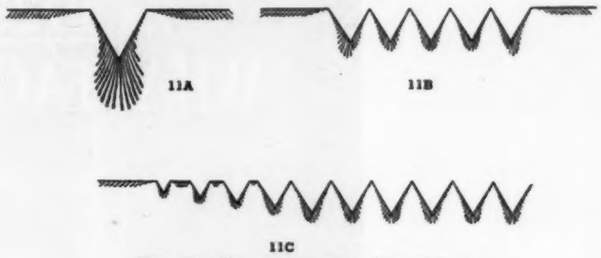



*Fig. 11—Stresses at the thread root*

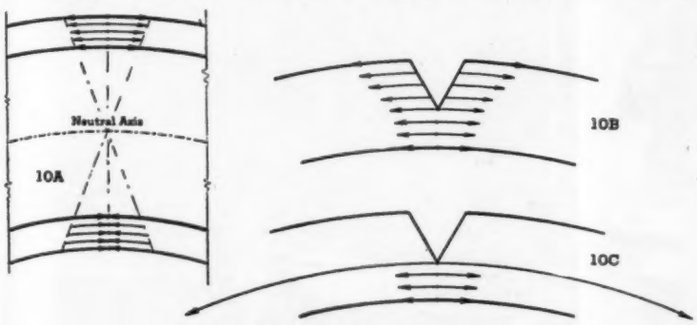



*Fig. 10—Stress concentrations*

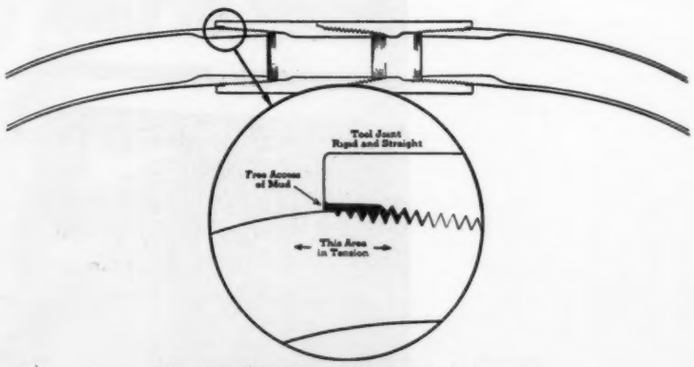
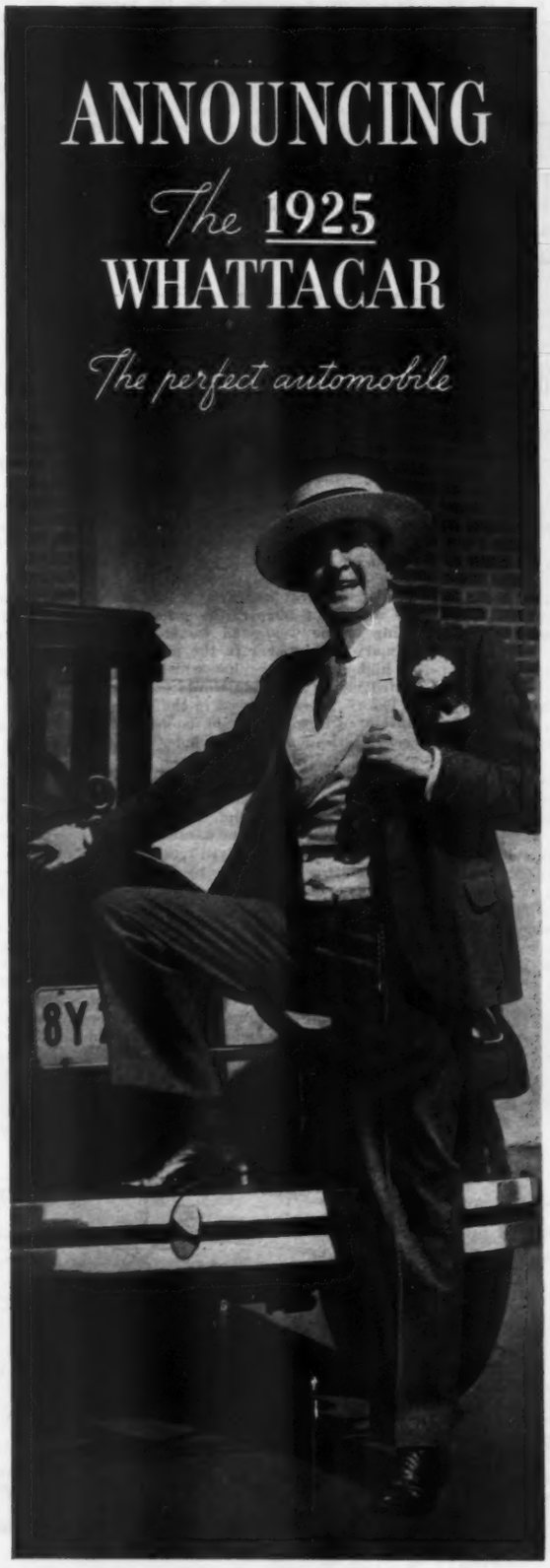



*Fig. 12—Corrosion fatigue notch failures*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ance are more desirable. This desirable variation of properties can be accomplished with no sharp variations to form points of weakness. This procedure constitutes an application to drill pipe of the differential hardening so successfully used in the automotive industry for rear axles and similar parts.

The metallographic structure produced by proper heat treatments in well-made steel of this grade (see Figure 16) represents exceptional refinement.

The physical properties obtainable in the tool-joint end of the integral drill pipe are comparable to those commercially available in tool joints of conventional design.

*Fig. 13 — Drill-pipe twist-off. Failure occurred through cold stamped figure 4*

### Evaluation of the Integral Tool Joint

The integral tool joint eliminates two-thirds of the threaded joints, where a tool joint is used between every two lengths of drill pipe. The threaded joints eliminated are a dangerous source of twist-offs, so that the integral drill pipe may be expected to contribute to cheaper and more rapid drilling. With a higher ratio of footage drilled to twist-offs experienced, this design is especially indicated for use in the very deep and very expensive holes that are becoming more and more common in which a single twist-off may be financially disastrous. Furthermore, the integral tool joint lends itself to any of the modern ideas as to full hole, and likewise to any desired thread form. And the very fact that the ends must be of tool-joint quality automatically insures a high order of merit in the drill pipe itself.

In comparing the serviceability of the integral-joint drill pipe with drill pipe fitted with conventional tool joints, it is obvious that worn tool joints cannot be replaced as is sometimes done when tool joints are threaded to the drill pipe. However, the integral joint can be re-threaded several times when necessitated by thread wear or by injury to the threads in stabbing. One string of integral-joint design which has already been in almost constant service for over a year is still operating on the original threads, and the wear on the outside diameter of the pins and boxes is sufficiently small to promise good service life.

In viewing the performance to be expected of integral-joint drill pipe, either as to itself alone or in comparison with drill pipe of conventional design, it is necessary to recognize that there is a class of drill-pipe failures which appears to originate in what has been called chemically-formed notches; i.e., under even the mildest of corrosive conditions there may form in the smooth wall of the pipe microscopic points of entry for fatigue cracks that will result in ultimate failure. Over five years' experience with the 2.50 per cent manganese grade of steel in drill pipe indicates that it has a fully normal resistance to this type of failure. Therefore, with external-threaded joints eliminated from the drill pipe by the integral-joint design, it appears that a considerable step has been taken toward the point where the only limit of drill-pipe service will consist of abrasive wear of the outside diameter.

### Resume

The text above presented follows briefly the long development of rotary drill pipe from its early form to a simplified mechanical design of advanced metallurgical quality. Specific points of importance that have been brought out are as follows:

1. Early drill pipe was manufactured by welding.
2. Increased strength was made possible by the seamless process.
3. The ordinary pipe coupling was early replaced by the tool joint.
4. The drill pipe was upset to compensate for reduction of wall thickness in threading.
5. The upsetting operation introduced metallurgical problems which require full-length normalizing for best results.
6. A large proportion of failures occurs in the threaded connection of drill pipe to tool joint.
7. The last-engaged drill-pipe thread acts as a notch peculiarly susceptible to fatigue breaks under corrosive conditions.
8. Drilling mud is a corrosive medium in promoting fatigue failures.
9. There is no true fatigue-endurance limit under corrosive conditions.
10. Twist-offs may occur by notch action under corrosion fatigue at very low stresses, particularly in older drill pipe.
11. Drill pipe should not be cold-stamped.
12. Welding the threaded connection of drill pipe and tool joint is an expedient, and not the best remedy for breaks or wash outs.
13. The use of welding to eliminate the threaded connection of drill pipe to tool joint involves difficulties that are unfavorable to the consideration of this method.
14. The threaded connection of drill pipe to tool joint can be eliminated by forging an upset on the drill pipe of proper shape to act as a tool joint.
15. Proper heat treatment of a forged integral joint of a special manganese steel produces a coupling adequate to tool-joint requirements.
16. The metallurgical and mechanical features in the design described appear favorable to improved drill-pipe performance.

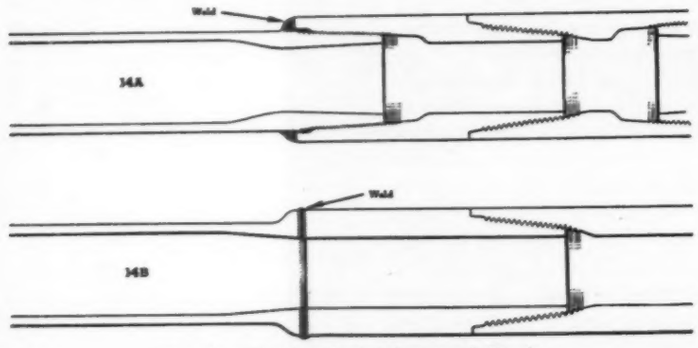


*Fig. 14—Welding tool joints to drill pipe*

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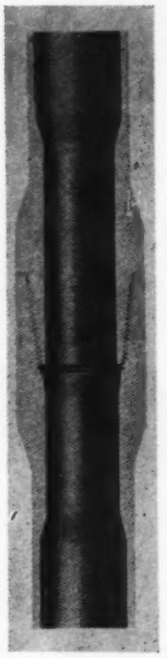

*Fig. 15—Forged upset tool joint integral with drill pipe*

**Analysis**

| | Per cent |
|---|---|
| Carbon | .27 |
| Manganese | 2.54 |
| Phosphorus | .025 |
| Sulphur | .030 |
| Silicon | .22 |

**Physical Properties**

| | Box | Pin | Body |
|---|---|---|---|
| Tensile, lbs. sq. in. | 123,200 | 117,300 | 117,600 |
| Yield, lbs. sq. in... | 103,800 | 95,900 | 92,300 |
| Elongation, % in 2" | 14.9 | 16.3 | 25.9 |
| Reduction, % .... | 39.1 | 34.9 | 50.8 |
| Impact, ft. lbs. .... | 40 | 25 | 78 |

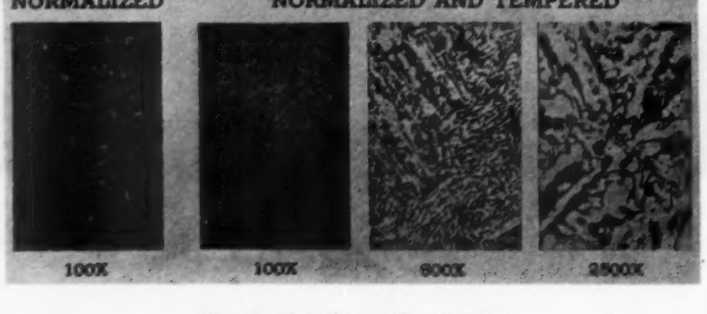


*Fig. 16—Metallographic structure*

## DISCUSSIONS

In The Oil and Gas Journal of May 16, page 82, there is printed a paper on "Drill Stem" by H. W. Fletcher, metallurgist, Hughes Tool Co., Houston, Tex., which was presented before the A.P.I. meetings at San Antonio, Tex., and Tulsa. The following discussions really cover the paper by H. W. Graham as well as the one by H. W. Fletcher and were presented after both of these papers were read at the recent midyear meeting of the American Petroleum Institute in Tulsa:

### DISCUSSION
By M. T. ARCHER

We know of no one more competent than Mr. Fletcher or Mr. Graham to analyze and present this subject. We hesitate to offer any comments and could, without any hesitancy, accept their statements as representing the best thoughts on the problem. Since all manufacturers are equally concerned, however, we should not pass the entire burden on to them and for this reason offer a few minor comments.

We agree that the predominant type of failure is that of fatigue, or more precisely, progressive fracture.

It is also evident that corrosive fatigue is a greater factor than has been heretofore realized. We know that the average endurance strength of steel, such as used for drill pipe, is reduced about half by corrosion. Since corrosive waters are encountered in many drilling districts this may be a major factor in drill pipe failure. We are just beginning to appreciate the importance of corrosion phenomena and it may well be that such influences are the dominant factors in the failure of many oil field materials.

Vibration, mostly transverse, is the principal mechanical destructive factor with present methods of drilling. We can hardly accept, however, that the prevailing type of pipe thread breakoffs are new. Such failures have been with us, though in the past probably from drastic bending due to excessive column weight, rather than the present transverse vibrations with the lesser column weight. Caving, needless to say, is always a menace to proper drill stem performance, even with the best of drilling technique.

We agree the most promising possibility for improvements in drill pipe is through mechanical design. We do not agree, however, that metallurgical improvement is hopeless and think there will be considerable progress made in that direction. We are not sure that much lighter weight in drill strings is the entire answer. Greater flexibility through use of smaller pipe diameter, perhaps, since at least one effect here is to reduce, of necessity, the applied force.

Higher rotative speeds are apparently gaining favor. We have in mind, however, some unsatisfactory results with high speeds in California about 12 years ago but believe there is a reasonable limit in that direction.

Regarding the galling difficulties encountered with the earlier tool joints, we would remind that for some time after the adoption of the Whittier tool joint, seven threads per inch predominated—an inheritance from cable tool joints. Galling was frequent and probably the first real advance in tool joint manufacture was the Union Tool Co.'s introduction of the present four-thread per inch standard. This, plus heat treatment, even with carbon steels, practically eliminated galling at the tool joint connection. Later heat treated alloy steels were introduced and are now used exclusively.

Regarding the relative merits of different thread forms: After careful consideration of the various thread forms, the A.P.I. adopted the present modified "V" threads. This decision, we believe, is sufficient reference on this point.

Seamless drill pipe first replaced lap weld approximately 20 years ago. The present upset proportions were not adopted until several years later. These upset proportions and the improvement in

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thread form appeared in about the same period.

We commend particularly Mr. Fletcher's very able explanation of the friction and reaction forces incorporated in the threaded connections. When one actually realizes the forces developed, we might reasonably express surprise that such joints hold up at all, rather than wonder why they fail.

We cannot too highly stress the value of remarks regarding the proper thread lubricant. Since our present method of drilling wells does involve so many threaded connections, we can well say that the development of zinc-bearing lubricants has been one of the outstanding contributions to our industry. Such lubricants are essential even with the present quality of steel and precision of manufacture. Imagine, therefore, what the problem was when only dead soft lapweld material and low carbon seamless were used. In fact this point became so vital that it induced Mr. Speller of the National Tube Co. to undertake the extensive analyses and tests which finally resulted in the development of this valuable lubricant.

It happened that the writer witnessed some of this development work and the great improvement which such lubricants permitted in the making up of threaded joints was immediately evident. Their value is so pronounced that it is now universal practice in all the pipe mills to apply metallic zinc to the coupling threads by electrolytic deposition. We are so thoroughly convinced of its merit that our company also electro-galvanizes all tool joint pipe threads and in addition advises plentiful use of the zinc-bearing lubricants when installing tool joints on drill pipe.

The mechanical factors involved in such tool joint thread connections have been ably presented and we are commenting only on the auxilliaries, such as lubricants, which will permit the proper makeup of the joints. With the aid of such lubricants, properly equipped shops can successfully make up the pipe connection between tool joints and drill pipe.

We cannot too strongly advocate the shop applications of such joints and are discouraged that application at the rig can be relied upon to give consistent results.

There is much room for improvement in the lubrication of the tool joint threads. Comment has been made on the usual field practice but no mention of the lack of uniformly satisfactory lubricants for such threads. Practically every operator has his own ideas and the writer submits that we have all been negligent in not developing a lubricant more suited to this service, than is now available.

Mr. Fletcher's academic discussion of the elastic behavior of the component parts of the joint is interesting. We are glad, however, of his conclusion that the theoretical corrections mentioned are not a practical solution. Such analyses are sound theoretically and good mental gymnastics but hardly applicable in actual practice.

The dominant cause of pipe end failures is the highly concentrated stress in the thread joint which is so aggravated by bending and vibrations as to exceed the endurance strength of the steel.

Joint end thread troubles, however, are in a large measure incidental to improper handling. This coarse thread is not a water-tight thread and depends entirely on the shoulder seal to maintain a tight joint. If this shoulder is not tightly engaged at all times, the high pump pressures will cause leakage through the joint, which leakage generally results in water-cutting at the shoulders and often through the thread. Very long strings of drill pipe are now common practice and it is evident that the elastic stretch of the pin, due to this weight, tends to separate the shoulders. It is necessary that the initial tightening effort be such that the subsequent stretch, due to the weight of the string, be not sufficient to relieve all the initial stress. Unless the tonged effort is sufficient to accomplish this, washouts are almost inevitable.

Considerable attention has recently been focused on the weight of the tool joints, with the thought that they promote an undesirable mass concentration which intensifies the stress at the thread connection. Discussion on this subject can be easily promoted. The rigid tool joints tend to develop higher stresses than the relatively flexible pipe body. On the other hand, the greater mass and different sections of these tool joints does have some dampening or flywheel effect and smoothes out the peak vibrations which would travel freely through the drill pipe. While a lot of words have been expended on this topic we do not think that an entirely acceptable mathematical analysis has yet been presented.

The full hole tool joint has received some acceptance as a correction for this mass concentration. However, their weights equal the standard A.P.I. joints and they have equal rigidity.

While there is always room for improvement it is doubtful if there can be any great reduction in the present proportions of tool joints and still retain their required strength.

Mr. Fletcher very ably explains the limitations as well as the serviceability of the present A.P.I. gauging system. We agree that this system has done very well indeed and further refinement would be placing a needless burden on the manufacturer and eventually, on the industry. It is our impression that the operators have been satisfied to rely on the integrity of the manufacturers and to accept the material as presented. There have been some minor controversies between manufacturers which, unfortunately, led some users to assume that mechanically imperfect material was being offered and that this was contributing to operating difficulties. We believe this difficulty has been satisfactorily eliminated and it is a fact today that the product of reputable tool joint and pipe manufacturers conforms to A.P.I. standards. From personal contact with many competitive pipe and tool joint manufacturers we can say that no other industry offers any better example of conscientious efforts to provide both quality of material and accuracy of manufacture.

Mr. Fletcher mentions several features in connection with these type failures which we believe are not sufficiently appreciated in the field. We have also noted similar failures having a high spot or gob of loaded metal on the shoulder at 90 degrees to the broken threads. Sometimes this has occurred on both sides. Also if the thread failure occurs while the joints are relatively new and little time permitted for wear the thread breakages were on one side only, but where the failure is on both sides the threads invariably show considerable wear.

Such loading on the shoulders tends to prevent shoulder contact and should be removed. If the proper tonging effort were exerted, many such small spots would be compressed into the material and still permit shouldering.

We concur in the remarks regarding the handling of drill pipe while running in and out of the hole. Particularly is damage done while coming out, since it is customary to put sufficient strain on the spring hook to jerk the pin free as the last thread leaves contact. Unless the floor-man can pull the pipe out of alignment before the rebound occurs, a very heavy blow will be struck on the tool joint shoulder by the point of the pin. One has only to examine most any string of drill pipe that has seen service to note this effect on the shoulders. Quite often sufficient leakage is caused thereby to cause premature failure at the shoulder.

Mr. Fletcher has so ably covered all points relating to material, manufacturing and operation and has so aptly described and illustrated the phenomena connected with various types of failures, that there is little of any consequence that can be added.

We believe this is the first time that this subject has been so presented that the manufacturer's side will be properly understood and the operators can visualize from the illustration and description the part that actual field operation plays.

In any event, Mr. Fletcher has made a notable contribution and if we have indulged in superfluous remarks, it is only to express our general agreement with and appreciation of his effort.

## DISCUSSION

By H. G. TEXTER

That a marked reduction of pipe failures through metallurgical improvement is unlikely is a debatable question, but it must be admitted that no headway is being made at the present time. Some of the most promising experiments along this line seem to be turning out very discouragingly.

Last engaged thread failures in the A.P.I. drill pipe upset are apparently very little affected by the analysis or physical properties of the steel and it is more evident every day that some radical change in the method of attaching tool joints to pipe must be developed. In fishtail drilling this type of failure is quite rare but in rock bit work the trouble seems to be on the increase. It is very evidently a typical fatigue failure, as pointed out, and certainly caused by vibration and aggravated by the following factors:

(a) Reduced drilling weights.
(b) Higher rotative speeds.
(c) Lighter drilling muds (sometimes clear water).
(d) Straighter holes.
(e) Mass concentration of the tool joints.
(f) Tighter initial makeup of tool joints, (to prevent leakage), resulting in practically no creep and therefore no change in stress concentration point.
(g) Corrosion fatigue.

Since very little can be done by manufacturers to vary the above factors the logical step would seem to be a radical change in the method of attachment of the tool joints to the pipe to eliminate stress concentration at the root of a thread. This happens to be the line of attack receiving immediate attention and there are now being tried out shrunk connections, integral joints and new thread forms of very interesting potentialities. Reduction in parasitic mass of the tool joint is also being given much thought and in the case of one radical departure from A.P.I. tool joints, is showing some evidence of success.

With present A.P.I. standards it seems definitely proven, for rock bit drilling, that the only safe course is to have the tool joints applied in a properly equipped shop and then welded to the pipe. This prevents both last engaged thread breaks and leakage between the tool joint and pipe. Leakage is much more often due to careless application of the joints, usually at the rig, than to errors in the threads of either the tool joint or the pipe.

It should not be supposed that box-pin or tool joint drill pipe leaks and breaks are the only troubles to be overcome. Let them be even partially solved and a new mess of trouble will undoubtedly develop in the form of fatigue failures in the body of the pipe. Then the metallurgist could step in with some assurance of improving the quality of the steel and the fight for ascendency would be on again.

## SHELL UNION OIL CORP.

Broekmans Administratrickantoor, N. V., of Amsterdam, Holland, is shown in the Shell Union Oil Corp.'s application with the SEC for permanent registration as the holder of 49,360 shares or 12.34 per cent of the 5½ per cent preferred stock of Shell Union. Royal Dutch-Shell held at the end of 1934 8,412,154 shares or 64.35 per cent of Shell Union common.

## ANGLO-PERSIAN OIL DIVIDEND

Anglo-Persian Oil, Ltd., has declared a final dividend of 12½ per cent, less tax, for 1934, as against 7½ per cent in 1933.

Preliminary statement of Anglo-Persian Oil Co., Ltd., for year ended December 31, 1934, shows profit of £3,183,195 comparing with £2,643,978 in 1933.

CIRCULATION 100,000

# BIG NEWS

EXTRA

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Published by Sinclair Refining Company (Inc.), 45 Nassau Street, New York, N. Y.

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# Impact Properties of Manganese Silicon Steels at Atmospheric and Sub-Zero Temperatures

By H. S. BLUMBERG
Metallurgist, M. W. Kellogg Co.

This study is one of several of a series which has for its ultimate goal the selection of that steel which has the most satisfactory combination of: (1) Low temperature impact resistance; (2) ease of manufacture and fabrication, and (3) low overall cost.

The need for this information is prompted by the increasing demands which are being made for metals to operate at sub zero temperatures. In the oil industry this requirement is particularly necessitated as the result of the development of the de-waxing process as applied to crude oil, which is carried out at temperatures in the vicinity of —40° F.

A review of the literature dealing with the characteristics of metals at low temperatures can be briefly summarized. It is shown that as the temperature of testing decreases metals usually gain some in tensile strength and yield point with a small decrease in elongation and reduction of area. The greatest property change, however, is known to take place in notched bar impact resistance and since shock is a definite factor in many applications, the impact resistance as determined upon a notched bar is commonly accepted as a criterion of the suitability of a material for low temperature service.

Investigators have shown that certain solid solution types of alloys, namely, the austenitic chromium nickel steels and the copper alloys such as Everdur and brass lose little in notched bar impact strength as the temperature is lowered to far below atmospheric temperature. A limiting factor in the use of these metals, however, is their high initial cost.

A number of studies have dealt with the problem of the sub zero shock resistance of simple steels. Until very recently it was definitely considered that plain low carbon steels gave very low impact values at temperatures as low as —50° F. Kinzel and co-workers[1] have drawn conclusions based on their experience in adding relatively small amounts of alloying elements. Herty's[2] experiments indicate that when plain low carbon steel is properly made, its low temperature impact properties are greatly improved. In connection with the latter, however, it is important that the welding properties of steels made in this manner be thoroughly investigated and proven to be acceptable before such steels are joined by welding in fabrication.

The recently published paper by Hopkins[3], deals with a study of a number of plain carbon and simple alloy steels, with particular attention to the fabrication and weldability of these metals, and the shock resistance of base metal and the welded joint. As a result of tests upon six commercially available and economical steels, the conclusion is reached that low carbon 2¼ per cent nickel steel possesses the best combination of satisfactory sub zero (—50° F.) shock resistance, ease of manufacture and fabrication together with relatively low cost, and accordingly this type of steel was selected for low temperature service.

Other investigators are at work upon this problem and data has been offered to show that low carbon, 1.5 per cent manganese, 0.4 per cent silicon steel is satisfactory for low temperature service. A recent paper deals with steel of this composition[4].

### Purpose of Present Study

The purpose of the present study was to investigate the sub-zero impact properties of steel of the analysis 0.15 per cent to 0.25 per cent carbon, 1 to 1½ per cent manganese, and 0.30 to 0.45 per cent silicon, and to compare these with the shock resistance values of 2¼ per cent nickel steel. No tests were made as to weldability or weld properties.

### Steels Studied

As a preliminary step inquiry was made among several steel producers to ascertain whether steel of this analysis was available in plate form. It was learned that few had ever made this composition and only one manufacturer was able to submit commercial material. Accordingly, there was obtained in addition four small experimental induction furnace heats especially made for this study and the five heats were studied in detail. Chemical analyses of these steels are given below:

| Mark: | C | Mn | P | S | Si | Ni | Cr | Cu | Mo |
|---|---|---|---|---|---|---|---|---|---|
| 1. Ajax Electric Corp. 30-lb. induction heat | .23 | 1.28 | .006 | .033 | .29 | .06 | .05 | .11 | None |
| 2. Ajax Electric Corp. 30-lb. induction heat | .24 | 1.09 | .006 | .033 | .25 | .05 | .20 | .10 | None |
| 3. Crucible Steel Co. 5" billet | .15 | 1.31 | .026 | .036 | .31 | .07 | .06 | .11 | None |
| 4. Midvale Company 30-lb. induction heat | .24 | 1.53 | .026 | .042 | .46 | .05 | .27 | .10 | None |
| 5. Midvale Company 30-lb. induction heat | .23 | 1.52 | .028 | .043 | .38 | .05 | .19 | .09 | None |

The induction heats were furnished in the form of 4-inch square tapered ingots while the Crucible Steel Co. section was a 5-inch square billet.

### Work Done

It was decided in this work to obtain data upon the effect of the following factors on impact properties:

1. Finishing temperature in rolling.
2. Normalizing temperature.
3. Rate of cooling after normalizing.

It is generally known that impact resistance is related to grain size. The latter is affected by finishing temperature in rolling and by subsequent heat treatment, and hence these factors were varied as far as possible in this investigation. Impact values are probably further related to metallographic structure and, therefore, the rate of cooling after normalizing was studied in order to determine what happens when thin and thick sections are normalized, such as is the case when light and heavy plates are made in the mill and subjected to practical fabrication heat treatments in the shop. When heavy plates are cooled from high temperatures as in rolling or normalizing, different rates of cooling are had in the center portion of these plates and that part of the section near the surfaces. Different grain sizes are accordingly produced and it was expected that this experimentation would yield data which would throw light upon the differences in impact values when impact test bars were taken from various locations in heavy plates and tested at room and low temperatures.

In order to study the effect of variation of finishing temperature in rolling, two rolling treatments were carried out. In the one, all mechanical work was done above the critical range, but in the other treatment, 25 per cent of the rolling was carried out below the magnetic point. Sections from the former are marked A, and from the latter, C. Rolling was done by the Midvale Co. and all bars were rolled to a section 1¼-inch square so that four impact bars could be obtained from each 2-inch of length.

It was also decided to study the effect of normalizing treatments upon the hot finished "A" bars and the cold finished "C" bars. Three temperatures were selected, the sections being held one hour per inch of thickness at heat:

1,590° F. — Mark 5
1,640° F. — Mark 6
1,950° F. — Mark 9

The first two temperatures were used to obtain the effect of heats just above the critical range and the last to study grain coarsening. In every case where these heat treatments were carried out, they were followed by stress-relieving to duplicate standard shop practice of today for pressure vessel construction.

Further, in order to observe the effect of rate of cooling from the foregoing temperatures, two rates of cooling were selected for each normalization. In the one the sections were air cooled at approximately 100° F. per minute in the range from the above temperatures to 1,000° F. Bars having had this treatment are marked N. In the other, to simulate the rate of cooling in the center portions of heavy plates, the sections were heated and air cooled in brick enclosures where cooling took place at approximately 12° F. per minute. These bars were marked B. Following these normalizing treatments all bars were stress-relieved, which treatment consisted of heating to 1,150° F. holding one hour per inch of thickness and furnace cooling.

Tests were also made upon bars which were stress-relieved only after the mechanical working. Mark for this treatment is SR and specimens were prepared representing sections originally hot and cold finished in the mechanical working.

There was thus available from each of the five steels impact bars representing the following conditions:

ASR—Hot finished, stress-relieved at 1,150° F., furnace cooled.
CSR—Cold finished, stress-relieved at 1,150° F., furnace cooled.
A5N—Hot finished, normalized 1,590° F., air cooled, stress-relieved.
A5B—Hot finished, normalized 1,590° F., brick cooled, stress-relieved.
C5N—Cold finished, normalized 1,590° F., air cooled, stress-relieved.
C5B—Cold finished, normalized 1,590° F., brick cooled, stress-relieved.
A6N—Hot finished, normalized 1,640° F., air cooled, stress-relieved.
A6B—Hot finished, normalized 1,640° F., brick cooled, stress-relieved.
C6N—Cold finished, normalized 1,640° F., air cooled, stress-relieved.
C6B—Cold finished, normalized 1,640° F., brick cooled, stress-relieved.
A9N—Hot finished, normalized 1,900° F., air cooled, stress-relieved.
A9B—Hot finished, normalized 1,900° F., brick cooled, stress-relieved.
C9N—Cold finished, normalized 1,900° F., air cooled, stress-relieved.
C9B—Cold finished, normalized 1,900° F., brick cooled, stress-relieved.

Eight impact bars were prepared from each steel representing each condition listed above. All bars were slotted from the outside surface with the standard Charpy keyhole notch, with dimensions as given in the American Society for Metals Handbook. Two bars were tested at room temperature, three at —50° F., and three at —75° F. The low temperatures were obtained by means of an acetone-dry ice bath and specimens were held under one hour at temperature be-

TABLE 1—AVERAGES OF CHARPY IMPACT VALUES OF ALL STEELS TESTED AT +70° F., —50° F., —75° F., AFTER THE VARIOUS TREATMENTS

| | SR | | | 5N | | | 5B | | | 6N | | | 6B | | | 9N | | | 9B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | +70 | —50 | —75 | +70 | —50 | —75 | +70 | —50 | —75 | +70 | —50 | —75 | +70 | —50 | —75 | +70 | —50 | —75 | +70 | —50 | —75 |
| 1A | 32 | 20 | 3 | 30 | 18 | 17 | 29 | 17 | 3 | 30 | 16 | 3 | 25 | 2 | 2 | 32 | 2 | 1 | 30 | 2 | 1 |
| 1C | 35 | 21 | 8 | 31 | 19 | 18 | 34 | 14 | 3 | 29 | 18 | 4 | 26 | 6 | 2 | 28 | 3 | 1 | 29 | 2 | 1 |
| 2A | 36 | 14 | 2 | 35 | 18 | 3 | 29 | 3 | 3 | 33 | 20 | 3 | 29 | 6 | 2 | 31 | 2 | 1 | 28 | 2 | 1 |
| 2C | 43 | 20 | 3 | 34 | 18 | 9 | 31 | 7 | 3 | 35 | 17 | 2 | 28 | 2 | 2 | 32 | 3 | 1 | 25 | 2 | 2 |
| 3A | 38 | 28 | 24 | 37 | 25 | 23 | 40 | 26 | 24 | 40 | 27 | 23 | 36 | 26 | 17 | 35 | 22 | 18 | 36 | 2 | 2 |
| 3C | 41 | 22 | 20 | 37 | 24 | 26 | 42 | 32 | 29 | 36 | 26 | 25 | 36 | 24 | 2 | 39 | 18 | 3 | 38 | 3 | 3 |
| 4A | 37 | 2 | 2 | 30 | 20 | 2 | 25 | 2 | 2 | 25 | 12 | 1 | 22 | 2 | 2 | 16 | 2 | 1 | 25 | 2 | 2 |
| 4C | 32 | 21 | 4 | 26 | 21 | 3 | 28 | 14 | 4 | 33 | 19 | 6 | 24 | 18 | 4 | 25 | 2 | 1 | 25 | 2 | 2 |
| 5A | 23 | 6 | 3 | 27 | 2 | 2 | 24 | 1 | 2 | 27 | 2 | 1 | 22 | 1 | 2 | 22 | 2 | 1 | 21 | 2 | 2 |
| 5C | 32 | 20 | 19 | 23 | 7 | 2 | 22 | 1 | 2 | 28 | 2 | 1 | 24 | 1 | 1 | 24 | 2 | 1 | 24 | 2 | 2 |

In all cases three bars were tested. The two values showing the least difference between them were averaged in each case. A total of 560 impact bars was broken in this investigation.

We know you will get more satisfaction, longer wear, even under the most severe service, from your transmission belting if you will change to HEWITT. For every type of HEWITT transmission belting is subjected to tests far more strenuous, far more destructive than any service encountered in industry. HEWITT knows the hard service requirements made of belting today, but in our testing laboratories far more amazing demands are made which HEWITT belting must meet. Thousands of pounds of pull in excess of tensile specifications, for instance, to make certain that every length of HEWITT transmission belting will make good our assurance of longer service, fewer replacements with HEWITT.

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fore testing. As a result of experience in testing several thousand impact bars at sub zero temperatures, it was possible to break bars in less than six seconds after they were removed from the cold bath.

Table 1 gives the average Charpy impact values obtained for each steel after each treatment and each testing temperature. Individual results are not given here because of the space required for the large number of impact test results. In every case the procedure followed was to average those two out of three results which showed the least difference. There are only five exceptions to the statement that in every case the difference between the values averaged was less than 2½ foot-pounds. For the exceptions noted, one difference was 6 foot-pounds and the others 4 foot-pounds and less. A total of 560 impact test bars were broken in this work.

All five steels were examined microscopically at 100 magnifications after etching in 4 per cent alcoholic nitric acid. Examination was made on cross sections of impact bars and each steel was observed after every condition of treatment. Because of the similarity in micrographs in the four experimental heats only two plates are shown here as representative of these steels after the various treatments. Photographic print No. 3,299 contains 100X micrographs of the commercial heat 3, and print No. 3,-294 is that of heat 1.

Brinell hardness readings were also obtained upon each steel after each treatment.

### Discussion

The factors involved in this study upon which there is data available enables one to draw conclusions between notched bar impact values at ordinary and sub zero temperatures and:

1. Chemical composition.
2. Finishing temperature in mechanical working.
3. Subsequent normalizing treatment.
4. Rate of cooling from the normalizing temperature.
5. Microstructure.
6. Brinell hardness.

### Variation in Chemical Composition

It will be noted that the chemical analyses of the five steels vary within small limits. The four induction heats are all of the same carbon content (0.24 per cent) with that of the commercial heat lower (0.15 per cent). The Mn content of the two heats 1 and 2 is .3 to .4 per cent lower than that of the heats 3 and 4, with that of heat 3 intermediate at 1.3 per cent Mn. Phosphorus is very low in heats 1 and 2. Silicon is lower in heats 1, 2 and 3 than in heats 4 and 5. Ni and Cu are uniformly low in all heats at approximately 0.15 per cent and 0.10 per cent, respectively. No molybdenum is present in any of the steels. Cr is low in heats 1 and 3, but in heats 2, 4 and 5 it is present in an amount of approximately one-fourth per cent.

### Effect of Stress-Relieving at 1,150° F. (After Two Conditions of Rolling)

When the as-rolled steels were given a stress relieving treatment of one hour per inch of thickness at 1,150° F. followed by furnace cooling, all showed acceptable values at room temperature.

At —50° F., only steels 1 and 3 were satisfactory after both rolling treatments followed by stress-relieving, but specimens from all heats absorbed more than 20 foot-pounds in testing where the rolling treatment consisted of carrying out the last 25 per cent below the magnetic point.

At a testing temperature of —75° F., only steel 3 gave values above 15 foot-pounds after both rolling treatments. Steel 5 showed 19 foot-pounds in the cold worked stress relieved condition but only 3 foot-pounds for the hot worked bars. In every case (except that of steel 3) the values obtained were higher where the last part of the rolling was carried out below the magnetic point.

### Effect of Normalizing After "Hot" and "Cold" Finishing, with the Normalizing Heat Followed by Two Rates of Cooling (Approximately 12° F. and 100° F. Per Minute) and Stress-Relieving.

(a) Normalizing at 1,590° F.

At room temperature all steels showed values which are generally similar to those after stress relieving only. No consistent difference was noted as traceable to the difference in rolling.

At —50° F. in those sections where the rate of cooling has been rapid from the normalizing temperature, steels 1, 2, 3 and 4 are acceptable, but steel 5 gave values considerably lower. There is a decided tendency for the steels slowly cooled from the normalizing heat to lose notched bar impact resistance, as shown by the lower values obtained after this treatment. Only steel 1 after hot rolling and steel 3 after both hot and cold rolling are acceptable, when this cooling has been slow.

At —75° F. the results are generally lower than those at —50° F. Again the effect of slower cooling after normalizing in lower impact value is noted.

(b) Normalizing at 1,640° F.

At room temperature all steels showed satisfactory values and practically no difference was observed due to the various factors.

At —50° F., when cooling from the normalizing temperature was rapid, steels 1, 2 and 3 were acceptable after both rolling treatments, whereas steel 4 gave an acceptable value only in the cold rolled condition, followed by stress-relieving. The effect of slow cooling after normalizing in lowering impact was again noted. Steel 3 was the only one acceptable after slow cooling.

At —75° F. none of the four experimental heats was acceptable after any of the treatments. When the rate of cooling following normalizing was rapid, steel 3 showed desirable shock values, but where this rate was slow, steel 3 fell far below the acceptable standard in those sections which had been previously cold rolled.

(c) Normalizing at 1,900° F.

The effect of this temperature upon values at room temperature was slight, since only a minor drop in impact resistance was observed.

At —50° F. all values are the lowest obtained in any of the bars tested. None of the bars tested was acceptable except steel 3, when the normalizing heat was followed by rapid cooling and stress-relieving. The detrimental effect of slow cooling after normalizing is again indicated as in this condition none of the steels was satisfactory.

At —75° F. none of the steels tested was acceptable, except steel 3 hot finished and rapidly cooled after normalizing. All other values were below 3 foot-pounds.

Consideration of the effects of chemical composition upon the impact properties reveals that steel 3 differs mainly from the others in its lower carbon content. This steel was consistently superior to the other steels tested under practically all the conditions and it would appear, therefore, that the lower the carbon content in these steels the greater the shock resistance at low temperatures. It is also possible that heat 3 has accidentally been given "proper" deoxidation treatment in its manufacture, as a result of which it was enabled to show such excellent results. No effect of manganese between the limits 1.1 and 1.5 per cent was observed. Heats 1 and 2 were very low in phosphorus. In general, these two steels gave higher values than 4 and 5 and it is indicated, therefore, that phosphorus has a detrimental effect upon shock resistance.

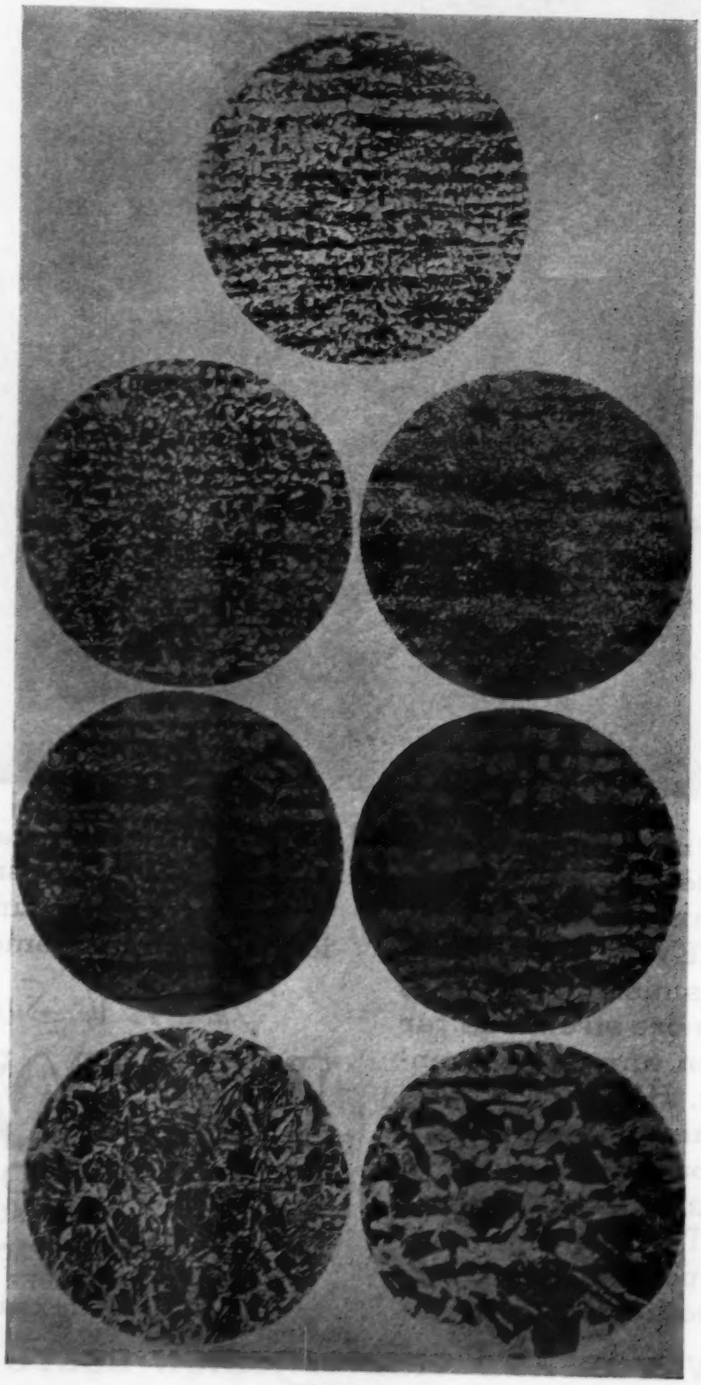
The effect of normalizing temperatures was shown to be definitely related to impact resistance at sub-zero temperatures. Where the normalizing temperature has been but little above the critical range with resultant small grain, the impact values are generally satisfactory, but where a coarser grain has been allowed to form as in the 1,900° F. treatment, a drastic lowering in the shock resistance of these steels at low temperatures is observed. This data further substantiates the findings of other investigators that impact resistance is closely related to grain size.

One outstanding effect noted from this data is that of the rate of cooling after normalizing. Where the rate has been rapid, higher impact values were obtained at low temperatures than where the cooling has been considerably retarded. This was particularly noticeable in the case of the four experimental heats which were higher in carbon and showed strong tendency toward banding as compared with the commercial heat numbered 3, in which this effect was observed definitely only after the high temperature normalizing treatment.

Another definite result was in relation to the rolling treatment followed by stress-relieving only. In every case when the steel was finish rolled for its last 25 per cent below the magnetic point, the shock values at low temperatures were definitely higher than in the case where all of the rolling was carried out above the critical range. It would appear from this fact that it would be of advantage in the manufacture of these steels for low temperature service to carry out at least 25 per cent of the mechanical working below the magnetic point.

Attention is called to the fact that there is only a small difference in shock resistance values at room temperature, due to the various conditions studied in this report. Differences are considerably greater at low temperatures.

Micrographs at 100 diameters are shown of charts Nos. 3,294 and 3,299. It will be noted that where normalizing treatment has been followed by rapid cooling, the grain size is considerably smaller than where the rate of cooling had been slower. This accounts for the higher impact values obtained after the



*STEEL A-1*

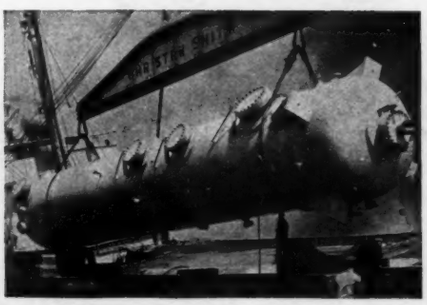
*Top: 1ASR—36-28, 16-20-20, 10-3-3; Upper left: 28-32, 18-18-14, 17-20-16; Center left: 1A6N—30-29, 16-16-18, 1-3-2; Lower left: 1A9N—30-33, 2-2-3, 1-1-1; Upper right: 1A5B—28-30, 19-16-9, 2-2-2; Center right: 1A6B—25-24, 2-8-2, 2-2-2; Lower right: 1A9B—30-30, 2-2-3, 2-2-3*

Stabilizer tower—8' 6" I.D.x2.02" thick x 71' 0"—weight 182,750 lbs. Masterwelded plate construction

Masterwelded viscosity breaker evaporator—12' 0" I.D.x1-3/16" thick x 95' 0".

Upper section—2 pass S.R. gasoline condenser containing 992—1" 11 admiralty tubes 14' 2" long.

KELLOGG MASTERWELD DUCTILE TOUGH



Evaporator tower—8' 0" I.D.x2" thick x 55' 4-3/8" long. Seamless construction.

Clay treating tower being x-rayed in Kellogg shop.

Inserting tube bundle in heat exchanger shell.

Kellogg heat exchanger sections assembled for shipment.

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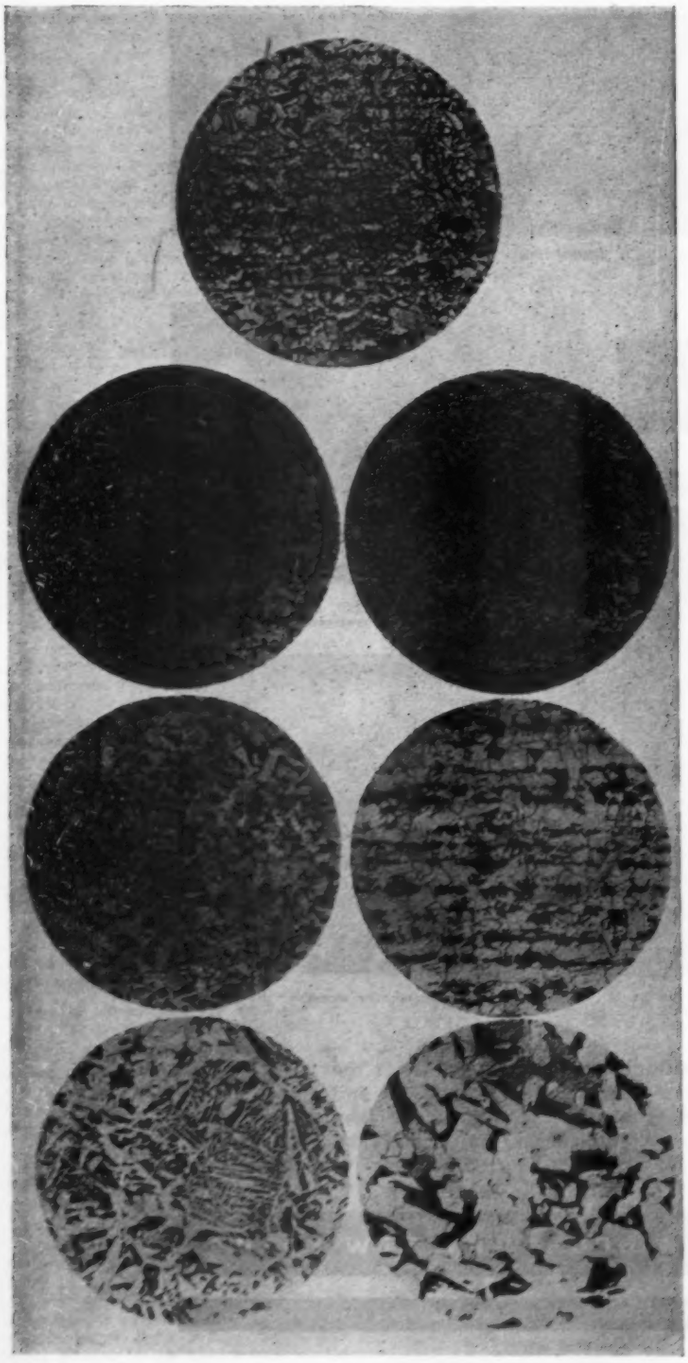
former treatment. The four experimental heats showed a decided tendency toward coarse banding. The average grain size produced after the 1,590° F. and 1,640° F. treatments is approximately identical in the various steels. Steel 3 shows the least tendency toward large grain after any of the treatments. The low impact values obtained after the 1,900° F. treatment are explainable in terms of the larger grain produced at this temperature.

If 12° F. per minute is considered to represent the rate of cooling of the center of a heavy plate and 100° F. per minute the rate of a light plate, the following classification may be made as to the acceptability of the steels studied in the present work. In the table the letter H refers to the condition of rolling which was all carried out above the critical range, while the letter C indicates that the last 25 per cent of the rolling was done below the magnetic point.

The table below shows that steels 1, 2, 4 and 5 would give unacceptable results in heavy plates after ordinary practical normalizing treatments. Steel 3 would be acceptable at —50° F. for any of the treatments except the 1,900° F. normalizing.

| Steel and rolling treatment— | Normalized at 1,590° F., Center of light pl. | Normalized at 1,590° F., Center of heavy pl. | Normalized at 1,640° F., Center of light pl. | Normalized at 1,640° F., Center of heavy pl. | Normalized at 1,900° F., Center of light pl. | Normalized at 1,900° F., Center of heavy pl. |
|---|---|---|---|---|---|---|
| 1 H | Acceptable | Acceptable | Acceptable | Not acceptable | Not acceptable | Not acceptable |
| 1 C | Acceptable | Not acceptable | Acceptable | Not acceptable | Not acceptable | Not acceptable |
| 2 H | Not acceptable | Not acceptable | Acceptable | Not acceptable | Not acceptable | Not acceptable |
| 2 C | Acceptable | Not acceptable | Acceptable | Not acceptable | Not acceptable | Not acceptable |
| 3 H | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Not acceptable |
| 3 C | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable | Not acceptable |
| 4 H | Acceptable | Not acceptable | Not acceptable | Not acceptable | Not acceptable | Not acceptable |
| 4 C | Acceptable | Acceptable | Acceptable | Acceptable | Not acceptable | Not acceptable |
| 5 H | Not acceptable | Not acceptable | Not acceptable | Not acceptable | Not acceptable | Not acceptable |
| 5 C | Acceptable | Not acceptable | Not acceptable | Not acceptable | Not acceptable | Not acceptable |



*STEEL 3-C*

*Top: 3C5R—43-39, 21-23-26, 21-22-19; Upper left: 3C5N—37-38, 25-22-10, 21-27-25; Left center: 3C6N—39-33, 26-26-24, 24-27-25; Left lower: 3C9N —38-40, 5-17-18, 3-2-4; Upper right: 3C5B—43-40, 32-19-33, 33-2-26; Center right: 3C6B—37-34, 23-24-24, 2-2-23; Lower right: 3C9B—37-40, 3-3-2, 2-2-2*

No such erratic results have been encountered in the many 2¼ per cent nickel steels which have been tested in this laboratory. With the latter steels normalizing treatments within 150 degrees from the upper critical range have in every case given satisfactory Charpy values.

It is also of interest to mention in this connection that private information from two large oil company laboratories agrees with our findings as to the erratic nature of manganese silicon steels. In one case, values of the order of 3 foot-pounds were obtained upon a commercial heat, whereas in the other case, low results were also obtained at —50° F., upon an experimental heat.

Brinell hardness readings were taken on all the steels in every condition. There is so little variation in these hardness numbers that the figures are not given. No relation was found between Brinell hardness and impact values.

### Conclusions

It is concluded from these tests that:

1. Steels of the composition .15 to .25 per cent carbon, 1.10 to 1.50 per cent manganese, and .30 to .50 per cent silicon, do not give consistent enough results at present to warrant their use at temperatures as low as —50° F. where shock is a factor.

2. The room temperature impact values of low carbon-silicon-manganese steels are but slightly affected by the various treatments to which they were subjected in this investigation, which involved variations in rolling temperature, normalizing temperature and rate of cooling after normalizing.

3. When these steels are given a stress-relieving heat treatment after rolling, greater shock resistance is maintained at low temperatures if part of the rolling is carried out below the magnetic point.

4. Acceptable low temperature impact values can be obtained in some steels by control of normalizing temperature to give small grain size.

5. The more rapid the rate of cooling from the normalizing temperature, the higher the shock resistance of these steels at sub-zero temperatures.

6. It appears that the lower the carbon and phosphorus contents the greater the shock resistance at the lower temperatures.

7. Stress-relieving does not improve the poor impact values obtained with coarse grain.

8. There is no relation between Brinell hardness and impact values.

9. It is felt that with proper control, steel of this analysis may have potentialities for low temperature service. Further experimentation is necessary, however, and it is probable that study of melting and deoxidation practices will yield a control which will give consistent and acceptable results.

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### Acknowledgement

The writer wishes to acknowledge the assistance given by R. K. Hopkins, director of metallurgical research and development of the M. W. Kellogg Co., under whose direction this study was carried out, also the assistance of J. W. Hunt, engineer of tests of the M. W. Kellogg Co.

## Common Steel Terms

**Tensile Strength**—Ultimate or maximum stress means the load material can sustain in tension without failure.

**Elastic Limit** is the maximum stress a material can bear without permanent set or distortion. Within certain limits steel is an elastic body and on being elongated by a tensile stress, returns to its original dimensions when the force ceases to be applied.

**Elongation** is the increased length which metal undergoes when subjected to a tensile stress sufficient to cause fracture.

**Reduction of Area** is the amount of contraction of area which takes place at the point of fracture when a metal bar is broken by a direct pulling force. Both the elongation and reduction of area furnish valuable information of the ductility of steel; the greater they are for the same class of material, the softer and more ductile the material may be considered.

**Yield Point** in ordinary commercial practice is the same as the elastic limit.

**Steel** is a chemical compound of iron and carbon; that is, it contains no carbon in the free states as cast iron does. Its tensile strength is greater than that of wrought iron, and its compressive strength greater than that of cast iron. Steel, unlike wrought iron is fusible, unlike cast iron it can be forged, and with the exception of the higher grades it can be welded by heating and hammering, although care must be take in so doing.

**Effect of Carbon on Steel**—Increasing the carbon content increases the tensile strength of steel.

**Effect of Sulphur on Steel**—When sulphur is over .06 per cent by weight there is a tendency to red shortness in steel. Numerous cracks are liable to develop during rolling which are imperceptible in the finished material, but which may later form starting points for rupture when material is subject to sudden stress.

**Free Cutting Steel,** for threading and screw machine work, is obtained by increasing sulphur content to about .075 to .10 per cent.

**Red Shortness**—Steel to be free from "red shortness" must be capable of being worked at all temperatures from a red to a welding heat without showing any signs of cracking or other defects.

**Cold Shortness**—Steel to be free of "cold shortness" must not show any signs of brittleness under sudden shock, or under a steadily applied load in the cold condition, the stress which such steel may reasonably be expected to bear varying with the carbon content.

**Effect of Phosphorous on Steel**—Produces brittleness and general cold shortness. On account of its treacherous nature it may be stated that the lower the phosphorous the better the grade of the steel.

**Effect of Manganese on Steel**—Manganese is added in the making of steel to prevent red shortness and to ordinary grades of steel ranges from about .30 to .60 per cent by weight.

When manganese is present in large amounts, 7 per cent or over, a special steel is produced, possessing great hardness.

# The Metallography of Weld Metal

By Dr. R. W. MOORE
General Laboratories, The Socony-Vacuum Oil Co., Inc.

The science and art of welding has provided the petroleum industry with a tool of considerable value. In fact, the fabrication of some pieces of equipment, for the production and refining of petroleum, without welding would be extremely difficult, if not impossible. For the repair and maintenance of equipment, welding offers a quick, easy and economical means of doing this type of work. Welding, as it was done in the early stages of the art, was not all that was to be desired. However, much progress has been made in recent years and it can now be said that welding can be applied not only to the more common varieties of steel but sound welds can be made of most, if not all, of the more complex heat resistant and corrosion resistant alloys.

It is not the purpose of this article to deal with all of the phases of welding or to list the numerous applications to which welding may be put. This would require a sizable text book upon the subject. It is our purpose, however, to show, by means of a series of photomicrographs, some of the metal structures encountered in the more common types of welding, and also the value of metallographic methods in the examination of welded joints.

As indicated in Figure 1, four samples of welding have been selected. In the first three, i.e., the arc weld with cellulose coated wire, the arc weld with bare wire, and the acetylene weld, the plate metal is ordinary one-half inch low carbon steel boiler plate. The cast iron plate is of the ordinary variety as received from a commercial iron foundry with no special alloying.

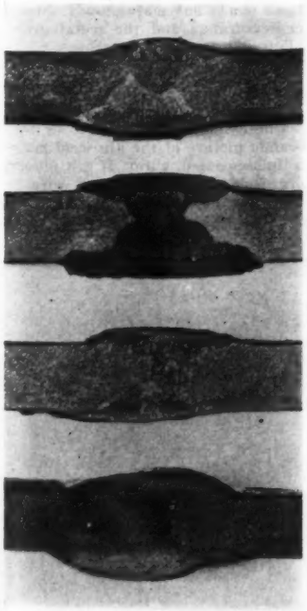


*Fig. 1*

The samples as shown in Figure 1 have been partially but carefully polished, first on coarse emery paper and finally on very fine emery paper, after which they were given, what is called by metallurgists, a deep acid or macro-etch in hot 1:1 hydrochloric acid. By this treatment, it can be seen that the metal structures vary not only among the different types of welds but also in various parts of a single weld. By this means of etching such things as seams, internal cracks, pipes, blow-holes, discontinuities in the metal, etc., may be recognized. In the arc weld made with the cellulose coated wire, it will be noted that the density or grain structure in the center of the weld is different from that at the edges of the weld or from that of the plate metal. The arc weld made with bare wire shows a considerable number of blow-holes and sharp discontinuity between the weld and plate metal. Incidentally, this type of welding does not give everything that is to be desired and is not practiced to any great extent at the present time. The fact that such a marked distinction occurs between the weld metal and the plate metal when treated with acid indicates that its corrosion resistance would not be good. Careful observation of the acetylene weld will reveal two small vertical parallel lines in the center of the weld. These lines indicate a discontinuity between the weld and the plate metal, which may undoubtedly be ascribed to poor welding technique. There has probably been a poor fusion of the metal or a carbide precipitation at these points. No doubt the strength of the weld would be somewhat impaired by these flaws. The cast iron weld shows not only a difference in density between the plate metal and the weld metal but also a slightly more marked attack by the acid in the plate metal adjacent to the weld metal. This is due to the fact that the plate metal in the vicinity of the weld has been altered somewhat by the heat from the fused weld metal. The flow of heat from the fused weld metal to the plate metal, of course, cannot be avoided in any type of weld, and this change in structure, as well as some others, need not necessarily be interpreted as entirely deleterious to the weld.

### Microstructures

The remaining photomicragraphs deal with the so-called microstructures as observed with a metallurgical microscope after very careful polishing on broadcloth and fine velvet with alumina suspended in water. The samples which have been etched to bring out the grain structure, have been given a light and careful treatment with 5 per cent nitric acid, in alcohol, hereafter referred to as nital.

Figure 2 is a photomicrograph of the arc weld made with the cellulose coated wire in the as polished or unetched condition at the junction of the plate metal with the weld metal. The plate metal can be identified by the large inclusions which run parallel to the direction of rolling of the plate. The weld metal contains numerous fine inclusions, which are evenly distributed throughout the metal.

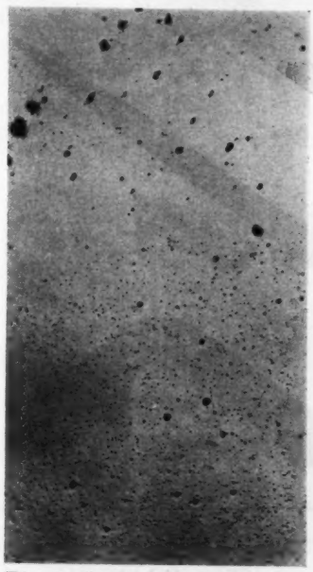

*Fig. 2—Arc weld cellulose-coated wire; junction of weld and plate metal; unetched; magnification 100X*

Figure 3 represents the grain structure found in the one-half inch boiler plate metal used to make the welds. This structure is normal for low carbon steel of this type. The light colored grains are ferrite or iron and the dark colored grains are pearlite or the constituent which contains the carbon.

As we move the sample under the microscope, from the plate metal toward the weld metal, we note that the structure of the dark patches or pearlite begin to change. This change in structure is shown in Figure 4. As was mentioned above, when the fused weld metal is deposited heat is transferred to the adjacent plate metal. This heating effect makes itself manifest in the type of grain structure revealed. Naturally, the heating effect is going to taper off as the distance from the fusion zone increases. These heating effects become marked only when certain temperatures are attained and also depend upon the time at which the metal is held at certain temperatures. Since the amount of plate metal is relatively large in comparison to the weld metal, the time at which the metal is held at temperatures which will change its structure is very small. This means that the area of plate metal in which the structure has been changed is not only small but also relatively close to the fusion zone. The type of structure revealed in Figure 4 is what is called a partially spheroidized pearlite. In other words, the dark pearlite patches segregate themselves into small globules or spheroids, as indicated in the photomicrograph. This type of change is one which occurs usually when the metal is heated to a temperature slightly under the so-called critical point of the steel, which, in this case, is about 1,400° F.

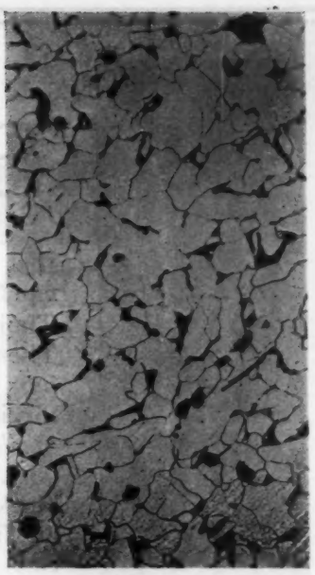

*Fig. 3—Low carbon steel plate etched with 5% nital; magnification 200X*

As the weld metal is approached but still observing the plate metal, another

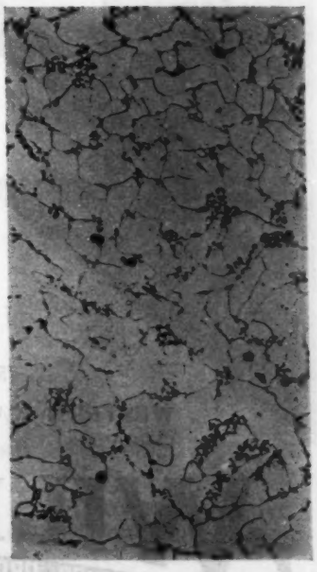

*Fig. 4—Arc weld with cellulose-coated wire; spheroidized area of plate metal; etched with 5% nital; magnification 200X*

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change in structure is revealed, as shown in Figure 5. The plate metal can here still be identified by the successive small inclusions giving the appearance of a

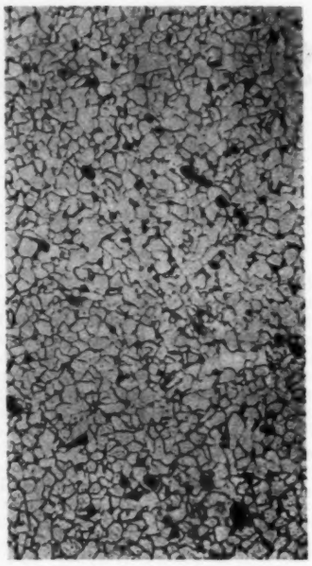

*Fig. 5—Arc weld with cellulose-coated wire; normalized plate metal adjacent to weld metal; etched with 5% nital; magnification 200X*

dark line. These lines of inclusions, due to the rolling of the metal, were also mentioned in Figure 2. It will be noted that the grain size of both the ferrite and the pearlite has become smaller and as the metallurgists say, more refined. Since the area represented by this structure is directly adjacent to the weld metal, a higher temperature will result and, as is expected by the metallurgist, exactly this type of structure will result. In this case the metal has been heated for a short time to a temperature just above the critical point of the steel. It has then cooled rather rapidly and the grains are small because time was not allowed for them to grow at the higher temperature. The area represented by this structure is often referred to as the normalized area.

### Grain Structure of Weld

Figure 6 shows the grain structure of

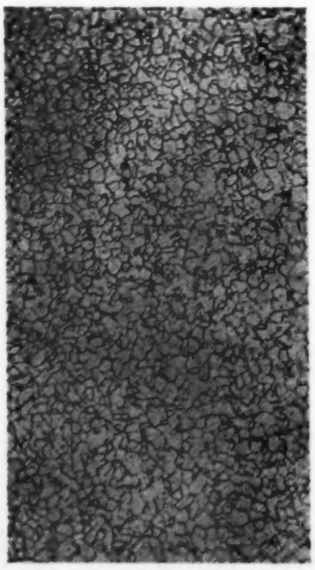

*Fig. 6—Arc weld with cellulose-coated wire; center of weld metal; etched with 5% nital; magnification 200X*

the weld metal in the center of the weld. It will be noted that the grain size is small and uniform.

As the sample is moved, under the microscope, so that the outside edge or the last metal deposited by the welder is observed, one sees the structure shown in Figure 7. It will be noted, in this case,

*Fig. 7—Arc weld with cellulose-coated wire; edge of weld metal; etched with 5% nital; magnification 200X*

that the grain structure is large. As will be recalled in the discussion of Figure 1, mention was made of metal of different density occurring in the weld metal. It is revealed here very strikingly by the variation in grain size. When weld metal is deposited by the arc weld method, it is laid down in successive layers by the so-called multi-pass method. As one layer of metal is deposited upon another, the fused metal of the last layer exerts a heating effect upon the metal below it. This heating effect serves to normalize the metal below in a manner similar to the normalizing of the plate metal mentioned above. The last layer of metal deposited, however, is not subjected to this grain refining treatment. It cools somewhat more slowly through the critical range and the metal grains are allowed more time to grow.

### Arc Weld With Bare Wire

Accompanying photomicrographs and discussion completes a more or less panoramic picture of the arc weld made with cellulose-coated wire. If we observe the arc weld made with bare wire in the same manner, we find somewhat different but interesting structures. Figure 8

*Fig. 8—Arc weld with bare wire; junction of plate with weld metal; unetched; magnification 100X*

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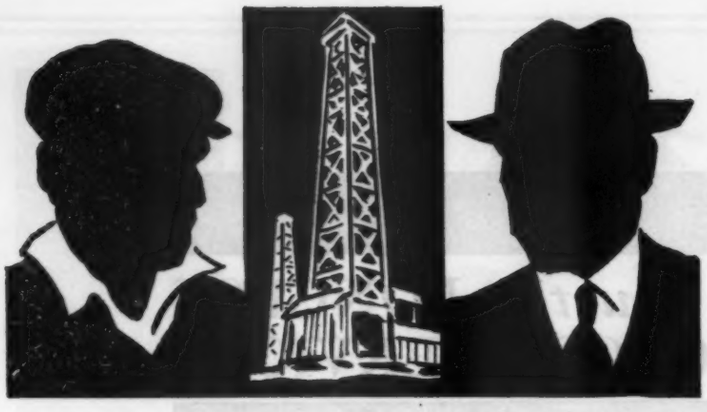

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shows the metal surface in the as polished but unetched conditions at the junction of the weld with the plate metal. The plate metal may again be identified by its parallel lines of inclusions. The weld metal appears almost free from imperfections, quite contrary to what is observed in Figure 1.

Upon etching this sample with the 5 per cent nital, we find the plate metal to be similar to that shown in Figures 3, 4 and 5. In other words, there is the normal plate metal structure, the spheroidized and normalized areas. Figure 9,

*Fig. 9—Arc weld with bare wire; junction of plate with weld metal; etched with 5% nital; magnification 200X*

taken at the junction of the plate with the weld metal, shows a portion of the fine grained normalized plate metal separated by a sharp line of demarcation from the weld metal. Figure 10, taken

*Fig. 10—Arc weld made with bare wire; center of weld metal; etched with 5% nital; magnification 550X*

at somewhat higher magnification, shows the structure of the weld metal. It will be noted that there are small straight lines projecting into many of the ferrite grains. These are so-called nitride needles. This means, therefore, that during the process of making the bare wire arc weld, the fused metal has been exposed to the atmosphere and taken up nitrogen. This did not take place in the arc weld made with cellulose coated wire because of a protective layer of gas formed by the burning of the coating. Nitrided metal is characteristically hard and brittle, and for this reason, this type of welding is not popular at the present time.

The as polished and unetched metal of the oxy-acetylene weld, at the junction of the plate with the weld metal, is shown in Figure 11. The plate metal appears similar to that in the other two welds. The weld metal, however, contains numerous small pits or inclusions.

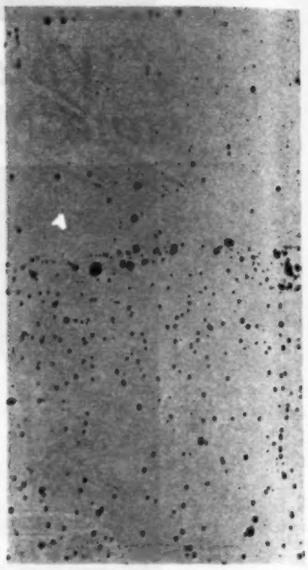

*Fig. 11—Oxy-acetylene weld; junction of weld with plate metal; unetched; magnification 100X*

After etching with nital, the grain size of the plate metal adjacent to the weld metal is shown in Figure 12. A

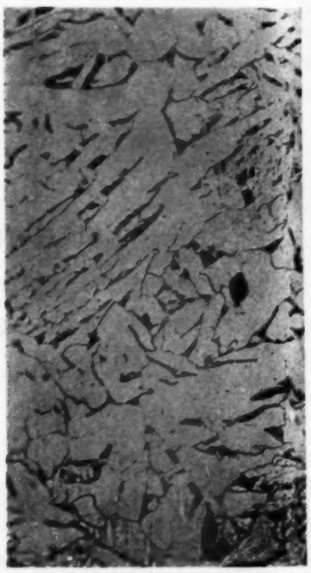

*Fig. 12—Oxy-acetylene weld; plate metal adjacent to weld metal; etched with 5% nital; magnification 200X*

variety of grain sizes will be noted here instead of the small uniform grain size as seen in the two previous samples. Figure 13 shows the weld metal and here again the large grain size will be observed. The large grain size in both of these cases has, no doubt, been produced by the heating of the weld with the torch to a temperature above the critical range of steel and the maintenance of this temperature for a sufficient period for grain growth to take place. This type of grain structure indicates that the metal would be soft and duc-

tile but would lack some of the strength of metal possessing smaller grain size.

The as polished and unetched section

*Fig. 13—Oxy-acetylene weld; center of weld metal; etched with 5% nital; magnification 200X*

of the cast iron weld at the junction of the plate and weld metal is shown in Figure 14. The dark areas in this case

*Fig. 14—Oxy-acetylene cast iron weld; junction of plate and weld metal; unetched; magnification 100X*

are graphite flakes. The plate metal is identified by the large graphite flakes and the weld metal by the smaller, more evenly distributed flakes.

Figures 15, 16 and 17 show the metal structures, after etching with nital, in cast iron plate metal, plate metal adjacent to the weld, and the weld metal, respectively. The dark graphite flakes will be seen as in the unetched section. The gray background is pearlite similar to that found in steel. At the grain boundaries of the pearlite will be found a lighter constituent called "Steadite," which contains the phosphorous. The light areas in gray cast iron, as in steel, are usually ferrite or iron. It will be noted that a large proportion of the grains of the cast iron are pearlite, while in the steel a large majority of the grains were ferrite. As in the case of the arc welds, the grain size of the cast iron weld metal, and the metal adjacent to it is smaller than that of the plate metal.

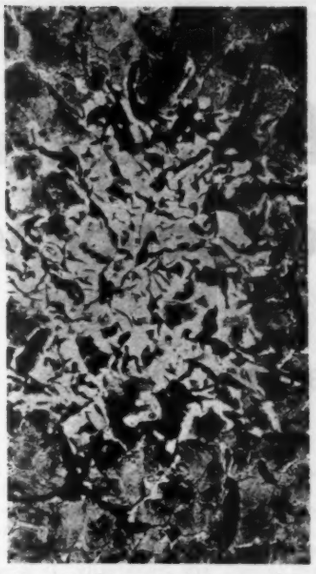

*Fig. 15—Oxy-acetylene cast iron weld; plate metal; etched with 5% nital; magnification 200X*

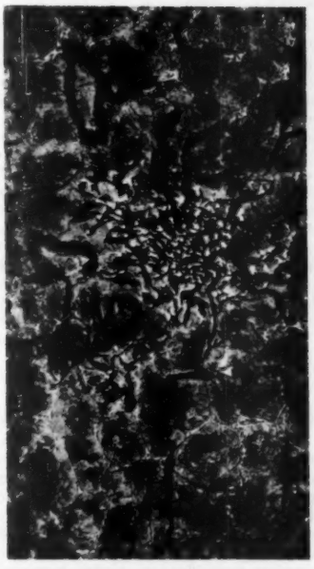

*Fig. 16—Oxy-acetylene cast iron weld; plate metal adjacent to weld metal; etched with 5% nital; magnification 200X*

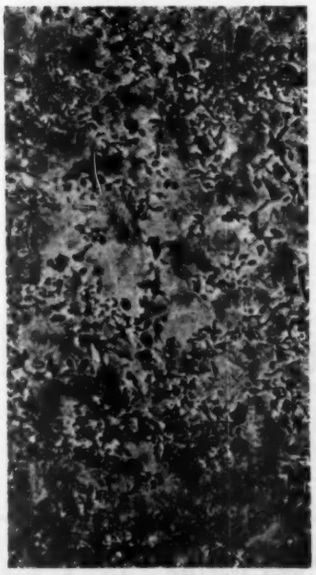

*Fig. 17—Oxy-acetylene cast iron weld; weld metal; etched with 5% nital; magnification 200X*

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# Selection of Materials for Sucker Rods Important in Ultimate Economy

By BLAINE B. WESCOTT and C. NORMAN BOWERS
Gulf Research & Development Corp., Pittsburgh, Pa.*

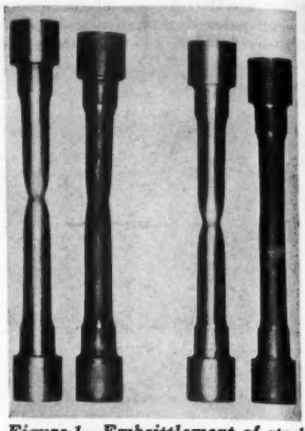

*Figure 1—Embrittlement of steel by hydrogen sulphide. Left to right: Nickel iron before exposure, nickel iron after exposure, 1.25% manganese steel before exposure, 1.25% manganese steel after exposure*

**Marked** improvement in the serviceability of sucker rods has been effected in the last two years, partly because of the insistent necessity for greater economy in the operating costs of crude oil production growing out of the general industrial depression and partly because many of the recently developed fields have imposed more severe operating conditions upon both surface and underground equipment. The latter is particularly true of Kansas where practically all of the oil produced is associated with damaging amounts of hydrogen sulphide brine and where the method of establishing potential production demands equipment capable of being operated at maximum capacity without interruptions. The decline of flush production in the Oklahoma City Field created new problems in deep well pumping on a scale heretofore unequalled and the increased proportion of water it has been necessary to produce in the fields of the Greater Seminole area presented conditions that were acutely in need of betterment. The problem in the latter fields was complicated by the shift towards sulphide characteristics which accompanied water encroachment and it is probably true that nowhere, at the present time, are pumping conditions generally as severe as in this territory. The Mid-Continent district has, therefore, become the proving ground for the numerous materials which have been proposed for sucker rod fabrication. The information which will ultimately be obtained from an unprecedented amount of field experimentation will pay ample dividends when the decline of East Texas increases the demand for the vast reserves of sour crude in West Texas.

It is a rare occurrence in industry that the use of such a simple piece of equipment as a sucker rod presents so complicated a problem for solution. As proof of this it is only necessary to consider the numerous types of sucker rods on the market at the present time and contrast this condition with that of less than four years ago when it was the common aim of each manufacturer to develop a single sucker rod for all conditions of service. It is recognized that this cannot be done economically and as a consequence manufacturers are offering from two to eight separate and distinct grades of sucker rods in addition to which nearly all of these grades are made in both double pin and box and pin types in lengths of both 25 and 30 feet. Obviously, such a wide variety is not conducive to low manufacturing costs nor does it simplify the problem of the user in selecting the most suitable grade of sucker rods for any particular kind of service.

### Classification of Wells

The present is a period of experimentation which will terminate, in all probability, in less than two years with, at most, four grades of sucker rods which will be sufficient to satisfy the requirements of all classes of pumping service. The two most important factors to be considered when selecting sucker rods are the weight of the well and the degree of corrosivity of the fluid produced. The first of these factors is fixed by the depth to the fluid, size of pump, length and speed of stroke and the gravity of the fluid produced. The weight of a well, or, perhaps more accurately, the stresses imposed on sucker rods may be varied almost at will by adjustments of the three pumping conditions subject to control of the operator, namely, the size of pump and the length and speed of stroke. Sucker rod failures can literally be controlled at will by regulation of pumping conditions and it becomes the problem of each operator to decide when the proper economic balance is obtained between value of extra oil produced and cost of the consequent increased well trouble.

The degree of corrosivity of the fluid produced is determined generally by the presence or absence of hydrogen sulphide. Hydrogen sulphide, which is usually associated with production from lime and seldom from sand, always is responsible for increased trouble from underground equipment if water is being produced with the oil; in the absence of water it presents no problem. While there are certain non-sulphide fields that produce corrosive brine with the oil, the problems which they present are neither as numerous nor as serious as those encountered in the sulphide fields.

The kinds of service, therefore, for which sucker rods should be designed are:

1. Non-corrosive fields.
2. Corrosive, non-sulphide fields.
3. Corrosive, sulphide fields.

There are no sharp dividing lines between these three classes of service nor does it necessarily follow that all wells within a single field belong in the same class. It may occasionally be found advantageous to subdivide one or more of the classes into light and heavy pumping wells. In the final analysis then it is advisable to make the classification in accordance with the grouping suggested, or with any other method that may be preferred, after consideration has been given to each well individually. It is essential that adequate individual well records be available if the greatest economy in production operations is to be assured.

Sucker rod failures are not excessive in the non-corrosive wells or fields (Class 1 above) and satisfactory sucker rods for these conditions have long been procurable. This is not true, however, of the corrosive conditions (Classes 2 and 3 above) and a sizeable degree of effort is being applied to the development of suitable rods for these purposes at the present time. In common with nearly all other corrosion problems, the real difficulty in solution is introduced by the necessity for providing a comparatively inexpensive material or materials for the purpose. Also in common with numerous other similar problems, the greatest ultimate economy is frequently not obtained if the selection of sucker rods is made only on the basis of original cost.

### Properties of Materials

There is no single physical property by which the suitability of a steel or iron for sucker rods may be judged. Furthermore, the common physical properties as ordinarily provided are of but little value in making a selection of sucker rods and if the choice is based solely on these properties it is certain to prove expensive in many instances. Some of the physical properties that are not ordinarily determined are of much greater importance and should, therefore, be given careful consideration.

The typical compositions of the various types of steels and irons used for sucker rods at this time are given in Table 1, which also includes the relative costs with respect to the cheapest plain carbon steel sucker rod. The regularly reported, representative physical properties of these alloys are given in Table 2. Consideration of these two tables indicates the wide variations both in composition and properties of the materials being utilized and emphasizes that sucker rods are passing through a transitory stage of development that is not at all characterized by unanimity of opinion.

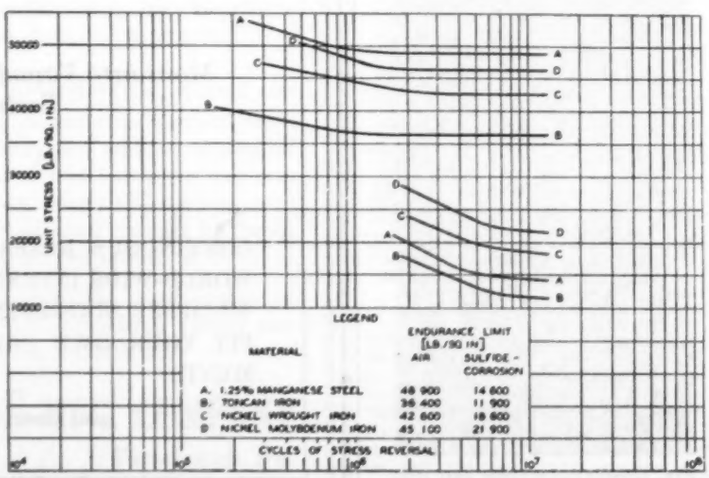


*Figure 2—Endurance properties of sucker rod materials in air and sulphide corrosion fatigue*

The much less commonly reported fatigue or endurance properties of the same steels and irons are given in Table 3. The endurance limits were determined under three conditions of test; in air (i.e., no corrosion), immersed in oil well brine, and immersed in oil well brine saturated with hydrogen sulphide. The manner in which these tests were conducted has been described elsewhere[1] and need not be repeated here. Also, the relation between experimentally determined endurance limits and those obtaining in actual operations was discussed in some detail and it was pointed out that while the two are not the same the experimentally determined values serve as a reliable means for the comparative classification of materials in their proper order of expected field performance. Since, as stated above, the most severe service is imposed on sucker rods in the sulphide fields the most significant property is the hydrogen sulphide endurance limit. The great reduction in these values when compared to the ordinary endurance limits provides ample proof of this statement. The actual magnitude of this reduction for any particular material is a measure of the damage suffered as a result of the presence of the highly corrosive sulphide brine and is expressed, in Table 3, as the ratio of sulphide corrosion endurance limit to air endurance limit. It will be noticed that the damage is not constant for all materials and that it is considerably less for the alloys of low carbon content. The lowering of the endurance limits in sulphide brine is not due solely to the greater corrosivity of the fluids; it is partly due to the embrittling action of hydrogen sulphide and it is also influenced by the susceptibility of the respective materials to stress concentration at the base of corrosion pits.

Instances of extreme brittleness of sucker rods are of quite frequent occurrence and this is caused by the action of hydrogen sulphide upon the steel. Relatively short exposure to the gas in the presence of water will embrittle steel seriously without any visible manifestation of the action either to the eye or at high magnification. The yield point and tensile strength are not affected, but there is a marked decrease in toughness, the extent of which can best be de-

*Also published in Transaction A.I.M.E. (1935), 114, Petroleum Development and Technology, under the title "Economical Selection of Sucker Rods."

[1]Blaine B. Wescott and C. Norman Bowers: "Corrosion Fatigue and Sucker Rod Failures"; fourteenth annual meeting, American Petroleum Institute, at Chicago, Ill., October 24, 1933.

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termined from measurements of elongation and reduction of area as given by ordinary tensile tests. Not all irons and steels are embrittled to the same extent and this factor should be considered in selecting sucker rods for use in sulphide fields. The extent to which some of the sucker rod steels are embrittled is given in Table 4. Of the six materials tested the 1.75 per cent manganese steel was embrittled to the greatest extent and the nickel iron was least affected. The manner in which the action of hydrogen sulphide is manifested is illustrated by Figure 1. The tensile test specimen at the left is nickel iron in the hot rolled condition, second from the left is a specimen of the same material after exposure to moist hydrogen sulphide. The two specimens on the right are 1.25 per cent manganese steel before and after exposure, respectively. In addition to loss of ductility the action of the gas entirely changes the nature of the fracture from the ordinary cup and cone appearance to one largely resembling failure by shear. From this fact and because of the short exposure required for embrittlement and the lack of visible evidence it seems probable that the action is intercrystalline. Interaction between hydrogen sulphide and iron results in the formation of nascent hydrogen which is adsorbed at the intercrystalline boundaries of the steel. The change of the adsorbed atomic hydrogen to molecular hydrogen is accomplished with increase in volume and consequent development of enormous internal pressure in the steel which causes the loss in toughness and decreases the resistance to shock. It has been shown[2] that if the metal is already under high internal stress, i.e., in a cold drawn condition, exposure to hydrogen sulphide for only a very short time may cause spontaneous rupture of the steel. It is, therefore, reasonable to suppose that a given steel would suffer more severely from this action in the heat treated condition than in the annealed or even hot rolled condition. Upon mild heating or rather extended standing at atmopheric temperatures steel recovers practically all of the ductility lost as a result of exposure to hydrogen sulphide.

### Effect of Stress Concentration

Corrosion of iron or steel in the presence of hydrogen sulphide quite generally causes pitting of the surface and surface pits in turn cause stress concentration because the continuity of the surface is disrupted. The base of a corrosion pit in a sucker rod is, therefore, a point of highly localized stress and if the operating stresses are high it is possible for the unit stress at these points to exceed the endurance limit of the material. If this is the case and the stress does not at the same time exceed the yield point an incipient crack will be developed which will ultimately cause a fatigue failure. If, however, both the endurance limit and the yield point are exceeded at a point, the material will yield in a plastic manner and effect a redistribution of stress without the formation of the incipient crack. In order to classify sucker rod materials with regard to their respective abilities to withstand highly localized stresses a series of tests was made to determine the endurance limits of notched specimens. In the absence of corrosion the stress concentration factors so found indicate the relative degree of sensitivity of the materials to surface discontinuities. The results are given in Table 5. It is apparent that the ratio of the depth of the notch (pit) to the section of the specimen has a marked effect on the stress concentration factor. The exact shape of the notch also influences the results, the concentration of stress being greater as the sharpness of the notch at its root increases. The low carbon, nickel alloys have greater resistance to stress concentration than the medium carbon, 1.25 per cent manganese steel. It is of interest to note that practically the same results were obtained from transverse and longitudinal methods of stressing.

[2] Leslie W. Vollmer and Blaine B. Wescott: "Effect of Hydrogen Sulphide on Wire Rope"; National Petroleum Meeting, of the American Society of Mechanical Engineers, Tulsa, October 6 to 8, 1930.

TABLE 1—CHEMICAL COMPOSITIONS AND RELATIVE COSTS OF SUCKER ROD MATERIALS

| Type— | Constituent (per cent) Carbon | Manganese | Phosphorus | Sulphur | Silicon | Chromium | Nickel | Molybdenum | Other constituents | Relative cost based on cheapest sucker rod |
|---|---|---|---|---|---|---|---|---|---|---|
| S.A.E. 1035 | 0.370 | 0.830 | 0.018 | 0.033 | 0.110 | ..... | ..... | ..... | ..... | 1.00 |
| S.A.E. 1045 | 0.450 | 0.840 | 0.027 | 0.041 | 0.210 | ..... | ..... | ..... | ..... | 1.00 |
| S.A.E. 1050 | 0.510 | 0.730 | 0.015 | 0.047 | 0.180 | ..... | ..... | ..... | ..... | 1.09 |
| S.A.E. 3130 | 0 340 | 0.650 | 0.015 | 0.020 | 0.190 | 0.580 | 0.990 | ..... | ..... | 1.25 |
| S.A.E. 4130 | 0.310 | 0.620 | 0.013 | 0.020 | 0.240 | 0.720 | ..... | 0.210 | .. . | 1.40 |
| S.A.E. 4615 | 0.180 | 0.510 | 0.012 | 0.006 | 0.230 | ..... | 1.576 | 0.240 | ..... | 1 22 |
| 1.25 per cent Manganese .. | 0.360 | 1.170 | 0.024 | 0.021 | 0.190 | ..... | ..... | ..... | ..... | 1.07 |
| 1.75 per cent Manganese .. | 0.330 | 1.910 | 0.023 | 0.016 | 0.210 | ..... | ..... | ..... | ..... | 1.13 |
| Toncan iron ..... | 0.050 | 0.290 | 0.009 | 0.006 | 0.050 | ..... | ..... | 0.110 | †0.510 | *1.20 |
| Wrought iron ..... | 0.030 | 0.040 | 0.083 | 0.012 | 0.160 | ..... | ..... | ..... | ‡4.200 | 1.30 |
| Nickel wrought iron ..... | 0.030 | 0.640 | 0.077 | 0.027 | 0.110 | ..... | 3.000 | ..... | ‡2.750 | 1.79 |
| Nickel iron ..... | 0.030 | 0.010 | 0.003 | 0.006 | 0.030 | ..... | 3.520 | ..... | ..... | 1 45 |
| Nickel molybdenum iron .. | 0.040 | 0.130 | 0.002 | 0.007 | 0.030 | ..... | 2.900 | 0.140 | ..... | 1.42 |

*Estimated. †Copper. ‡Slag.

TABLE 2—STATIC PHYSICAL PROPERTIES OF SUCKER ROD MATERIALS

| Type— | Heat treatment (°F.) Quench | Normalize | Draw | Yield point (lb./sq. in.) | Tensile strength (lb./sq. in.) | Elongation (% in 2 in.) | Reduction of area (%) | Charpy impact (ft.-lb.) | Hardness (Brinell number) |
|---|---|---|---|---|---|---|---|---|---|
| S.A.E. 1035 | .... | .... | .... | 55,500 | 88,500 | 31.3 | 56.4 | 30.3 | 169 |
| S.A.E. 1045 | .... | 1,600 | .... | 62,300 | 96,500 | 28.3 | 52.3 | 19.2 | 191 |
| S.A.E. 1050 | *1,550 | .... | 1,100 | 100,700 | 123,200 | 21.5 | 59.4 | 29.7 | 230 |
| S.A.E. 3130 | .... | 1,600 | .... | 81,900 | 100,500 | 27.8 | 70.6 | 51.8 | 213 |
| S.A.E. 4130 | *1,550 | .... | 1,150 | 111,300 | 128,500 | 16.6 | 67.2 | 40.5 | 267 |
| S.A.E. 4615 | .... | .... | .... | 58,500 | 84,700 | 29.0 | 66.0 | 33.7 | 171 |
| 1.25 per cent Manganese | .... | .... | .... | 71,300 | 100,000 | 24.8 | 63.9 | 34.6 | 206 |
| 1.75 per cent Manganese | .... | 1,550 | .... | 72,900 | 118,200 | 23.5 | 56.3 | 32.1 | 235 |
| Toncan iron | .... | .... | .... | 43,100 | 51,900 | 43.3 | 80.5 | 55.1 | 106 |
| Wrought iron | .... | .... | .... | 42,100 | 47,700 | 33.6 | 46.4 | 19.9 | 74 |
| Nickel wrought iron | .... | .... | .... | 58,100 | 63,900 | 31.0 | 50.2 | 24.0 | 149 |
| Nickel iron | .... | .... | .... | 47,900 | 58,100 | 40.8 | 72.3 | 44.5 | 126 |
| Nickel molybdenum iron | .... | .... | .... | 52,500 | 63,600 | 37.8 | 70.3 | 43.5 | 140 |

*Water quench.

Some speculation has heretofore been connected with the effect of instantaneous shock loads of high magnitude on the different steels giving rise to uncertainty as to which types are best able to resist this action. Tensile impact tests furnish some information in answer to this question. Results of such tests on sucker rod materials, given in Table 6, bring out several interesting facts. There is an exceedingly close agreement between the values for elongation and reduction of area as determined in regular tensile tests (see Table 2) and in the tensile impact tests. The unit tensile impact resistance is more closely related to ductility as determined by reduction in area from tensile tests than to any other of the regularly determined physical properties. There is no apparent relationship between tensile impact strength and either tensile strength or yield point since, for example, S.A.E. 4,130 steel, heat treated to a tensile strength of 128,500 lbs./ sq. in., had practically the same tensile impact resistance as the nickel wrought iron with a tensile strength of only 63,900 lbs./sq. in. Apparently internal stress such as results from full heat treatment (quench and draw) or structural heterogeneity such as is characteristic of wrought iron tend to have a deleterious effect on tensile impact resistance.

### Evaluation of Materials

The value of data on the properties of materials is dependent, of course, upon the extent to which it can be translated into the purchase of equipment which will prove to be most economical for a given purpose. In attempting to apply these data to sucker rods it is important to consider what operating stresses they will be subjected to. There is ample information available to conclude that stresses of 30,000 lbs./sq. in. are not uncommon in Mid-Continent wells even when graduated strings of seven-eighths inch and three-quarters inch sucker rods are used. In corrosive fields where pitting occurs this stress may be increased by a factor of from 1.3 to 2.5 because of stress concentration at the bottom of pits with the result that the stress at such points considerably exceeds the endurance limit. The average stress concentration factor is probably between 1.5 and 2.0 so that the localized stresses may occasionally be as high as 60,000 lbs./sq. in. The desirability of having the yield point low enough to be exceeded and thus permit redistribution of stresses has been alluded to previously. It has been concluded, therefore, that for this type of service, i.e., in sulphide fields, the sucker rod material should have a yield point between 50,000 lbs./sq. in. and 60,000 lbs./ sq. in. At the same time, maximum ductility and toughness should be provided by keeping the carbon content less than 0.10 per cent. The alloying elements used to obtain the above specified yield point should preferably belong to the class that forms solid solutions with the ferrite; carbide forming elements are less desirable. High endurance and corrosion endurance limits are of great importance although it is probable that various materials will not differ greatly in this respect if the other properties have been properly regulated. The tensile strength does not appear to be of any sensible moment so long as the other properties meet the requirements.

An effort has been made to develop a more or less exact method for the evaluation of materials for operation under sulphide conditions by means of the following equation:

$$V = (1 - 5X^2)\frac{(SL)^3}{W \times 10^6} \qquad (1)$$

where:

V = the index value.

$X = \dfrac{\text{yield point} - 55{,}000}{55{,}000}$

SL = sulphide corrosion endurance limit.

W = calculated unit stress for any given conditions of operation.

This formula is based on the assumption that the optimum yield point for these conditions is 55,000 lbs./sq. in. The index value is lowered at an increasing rate by departures in yield point either above or below the optimum value and is proportional to the cube of the endurance limit. Attempts to evaluate materials on a basis of physical properties are of somewhat uncertain dependability and are admittedly empirical and arbitrary, but while the proposed equation is not an exception there is considerable evidence in its support from actual service records. The formula is only applicable to materials with yield points between the minimum value of 31,000 lbs./sq. in. and the maximum value of 79,000 lbs./sq. in. Field experience indicates that materials with yield points of less than 40,000 lbs./ sq. in. or in excess of 70,000 lbs./sq. in. are quite unsuited for this type of service.

To illustrate the application of this formula several materials have been evaluated for expected service at a peak load of 30,000 lbs./sq. in. in Table 7. To decide whether a more expensive material would be justified for any particular case the initial cost and repair expense of the cheaper material would be compared with the initial cost and the repair expense of the more expensive material estimated from the comparison of the respective index values of the two.

The index values cannot be applied too literally since the formula by which they are calculated does not take into account two important interdependent factors, time and overstressing. Materials in fatigue service, i.e., subjected to repetitive stressing, behave differently when the applied stresses exceed the endurance limit. Since failures occur, this is the condition (overstressed) under which sucker rods operate. The fatigue curves (S-N diagrams) of four sucker rod materials in air and in sulphide corrosion are given in Figure 2. The endurance limit is the stress at which these curves either approach or become horizontal. For steels the curves become truly horizontal in the absence of corrosion, but they never become truly horizontal in corrosion fatigue; the divergence increases with increasing degree of corrosivity. The portions of the curves to the left of the abrupt change in slope describe the behavior in the region of overstressing. It is characteristic of all materials being discussed that the damage from overstressing is much less in the absence of corrosion. Stated somewhat differently, under corrosive conditions overstressing will cause sucker rod failures in a much shorter period than under a similar degree of overstressing under noncorrosive conditions. Therefore, the selection of a material must take into account the ratio of stresses imposed by the given operating conditions to the respective endurance limit as well as the index value. For example, it would be unwise to select wrought iron for service in a well where the stresses exceed 30,000 lbs./sq. in. even though its index value is comparatively high; much more economical service would be obtained from one of the materials with higher sulphide endurance limit even at a greater cost. Experience indicates that greatest freedom from failures will be obtained when the ratio of operating stresses to endurance limit it less than 1.5.

A similar method for classification of materials could, if time permitted, be described for nonsulphide corrosive service. However, in this case it should be noted that since the corresponding endurance limits are higher the optimum yield point is also higher. It is in this type of service, therefore, that the higher strength, less expensive materials can be used with economy.

### Selection of Materials

The opinion was expressed earlier that not more than four different types of sucker rods were needed to successfully satisfy all demands of current operating conditions. At least three times this number of types are available. It will require one or two years of operating experience to indicate definitely from an economic standpoint which four materials are most worthy of retention. The uncertainty at present is almost entirely concerned with materials for heavy pumping service in sulphide fields and it is doubtful whether the material of greatest ultimate economy has even yet advanced to the stage of field tests. Four materials, all alloys of nickel, are now giving improved service under these conditions, but entirely too little attention has been given to alloy-

ing materials other than the comparatively expensive nickel.

A classification of the 13 materials, now being used, according to conditions of service is given in Table 8. This classification, which expresses the opinions only of the authors, takes into account the physical properties of the materials which have been discussed.

**Acknowledgments**

The authors acknowledge appreciation to Dr. P. D. Foote, executive vice president of the Gulf Research & Development Corp., for permission to publish this article and to Dr. M. Muskat and L. W. Vollmer of the same organization for suggestions in the preparation of the manuscript.

**TABLE 3—ENDURANCE PROPERTIES OF SUCKER ROD MATERIALS**

| Type— | Heat treatment* (° F.) Quench | Normalize | Draw | Endurance limit (lb./sq. in.) Air (AL) | Corrosion (CL) | Sulphide corrosion (SL) | Ratios CL/AL | SL/AL |
|---|---|---|---|---|---|---|---|---|
| S.A.E. 1035 | .... | .... | .... | 40,600 | 24,600 | 10,600 | 0.61 | 0.26 |
| S.A.E. 1050 | *1,550 | .... | 1,100 | 66,900 | 25,600 | 14,100 | 0.38 | 0.21 |
| S.A.E. 3130 | .... | 1,600 | .... | 55,100 | 31,600 | 15,900 | 0.57 | 0.29 |
| S.A.E. 4130 | *1,550 | .... | 1,150 | 70,100 | 26,900 | 14,100 | 0.38 | 0.20 |
| S.A.E. 4615 | .... | .... | .... | 48,600 | 32,100 | 19,900 | 0.68 | 0.41 |
| 1.25% manganese | .... | .... | .... | 48,900 | 19,600 | 14,600 | 0.40 | 0.30 |
| | | | | †45,000 | | | | |
| 1.75% manganese | .... | 1,550 | .... | 56,400 | 29,400 | 12,100 | 0.52 | 0.21 |
| Toncan iron | .... | .... | .... | 36,400 | 16,900 | 11,900 | 0.46 | 0.33 |
| Wrought iron | .... | .... | .... | 30,400 | 19,600 | 16,400 | 0.64 | 0.54 |
| Nickel wrought iron | .... | .... | .... | 42,600 | 25,100 | 18,600 | 0.59 | 0.44 |
| | | | | †39,500 | | | | |
| Nickel iron | .... | .... | .... | 39,600 | 26,900 | 19,100 | 0.68 | 0.48 |
| Nickel molybdenum iron | .... | .... | .... | 45,100 | 25,400 | 21,900 | 0.56 | 0.49 |

*Water quench. †Values determined for complete reversal of axial stress by Haigh Axial Testing Machine at the Research Laboratories of the Westinghouse Electric & Manufacturing Co.

**TABLE 4—EMBRITTLEMENT OF SUCKER ROD STEELS BY HYDROGEN SULPHIDE**

| Material and condition— | Before exposure to hydrogen sulphide Elongation (% in 2 in.) | Reduction in area, % | After exposure to hydrogen sulphide Elongation (% in 2 in.) | Reduction in area, % | Per cent decrease (embrittlement) Elongation | Reduction in area |
|---|---|---|---|---|---|---|
| 1.25% manganese, as rolled | 29.0 | 64.2 | 21.5 | 37.6 | 25.9 | 41.5 |
| 1.25% manganese, normalized | 27.5 | 64.5 | 17.8 | 34.3 | 35.3 | 46.8 |
| 1.75% manganese, normalized | 28.5 | 66.0 | 17.0 | 23.8 | 40.4 | 63.9 |
| S.A.E. 4615, as rolled | 29.0 | 66.0 | 18.7 | 30.8 | 35.5 | 53.3 |
| Nickel wrought iron, as rolled | 31.0 | 50.2 | 22.5 | 29.0 | 27.4 | 42.1 |
| Nickel iron | 40.8 | 72.3 | 32.0 | 45.5 | 21.6 | 37.1 |

**TABLE 5—STRESS CONCENTRATION FACTORS OF SUCKER ROD STEELS**
(60° groove having a radius of 0.0065 in. at its extremity)

| Material and condition— | Endurance limit (lb./sq. in.) Unnotched | Notched | Ratio Depth of groove / Dia. of specimen | Stress concentration factor |
|---|---|---|---|---|
| Armco ingot iron (hot rolled) | 32,100 | 21,100 | 0.013 | 1.52 |
| Wrought iron (double refined) | 30,400 | 19,600 | 0.013 | 1.55 |
| Nickel wrought iron (normalized 1,600° F.) | 41,100 | 29,900 | 0.013 | 1.37 |
| Nickel iron (normalized 1,600° F.) | 42,400 | 29,600 | 0.013 | 1.43 |
| Nickel wrought iron (hot rolled) | 42,600 | 16,900 | 0.100 | 2.52 |
| | *39,500 | *16,800 | 0.100 | 2.35 |
| 1.25% manganese steel (hot rolled) | 48,900 | 27,100 | 0.050 | 1.80 |
| | | 16,900 | 0.100 | 2.90 |

*Results obtained from tests on Haigh axial testing machine at the Research Laboratories of the Westinghouse Electric & Manufacturing Co.

**TABLE 6—TENSILE IMPACT PROPERTIES OF SUCKER ROD MATERIALS**

| Type— | Heat treatment* (° F.) Quench | Normalize | Draw | Impact resistance (ft. lb.) | (ft. lb./sq. in.) | Elongation (% in 2 in.) | Reduction of area, % |
|---|---|---|---|---|---|---|---|
| S.A.E. 1045 | .... | 1,600 | .... | 124.2 | 4,880 | 26.7 | 53.8 |
| S.A.E. 1050 | *1,550 | .... | 1,100 | 109.2 | 4,310 | 18.5 | 61.7 |
| S.A.E. 3130 | .... | 1,600 | .... | 110.0 | 4,320 | 22.7 | 72.1 |
| S.A.E. 4130 | *1,550 | .... | 1,150 | 82.8 | 3,260 | 14.0 | 68.3 |
| S.A.E. 4615 | .... | .... | .... | 116.2 | 4,570 | 29.3 | 66.2 |
| 1.25% manganese | .... | .... | .... | 120.0 | 4,700 | 24.5 | 65.5 |
| 1.75% manganese | .... | 1,550 | .... | 112.8 | 4,440 | 19.0 | 65.0 |
| Toncan iron | .... | .... | .... | 106.5 | 4,190 | 37.0 | 71.5 |
| Wrought iron | .... | .... | .... | 65.7 | 2,590 | 22.0 | 30.8 |
| Nickel wrought iron | .... | .... | .... | 82.7 | 3,300 | 29.0 | 36.6 |
| Nickel iron | .... | .... | .... | 114.8 | 4,520 | 41.2 | 75.7 |
| Nickel molybdenum iron | .... | .... | .... | 118.7 | 4,670 | 39.5 | 74.3 |

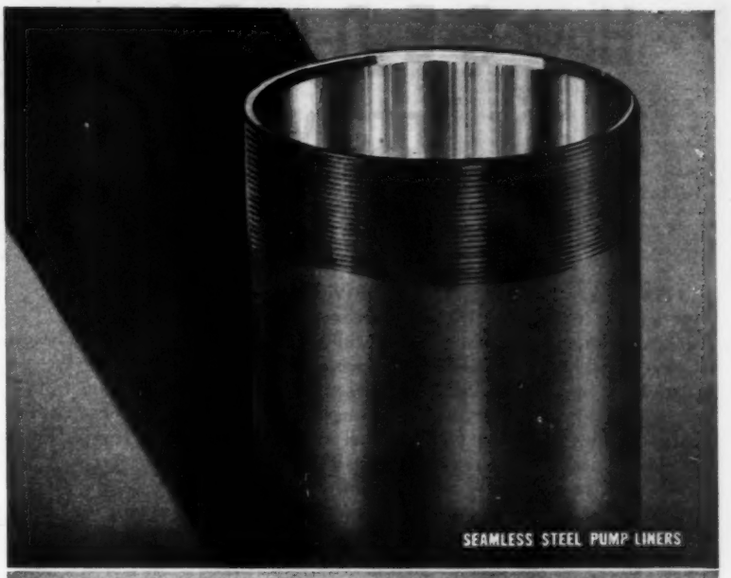
*Water quench.

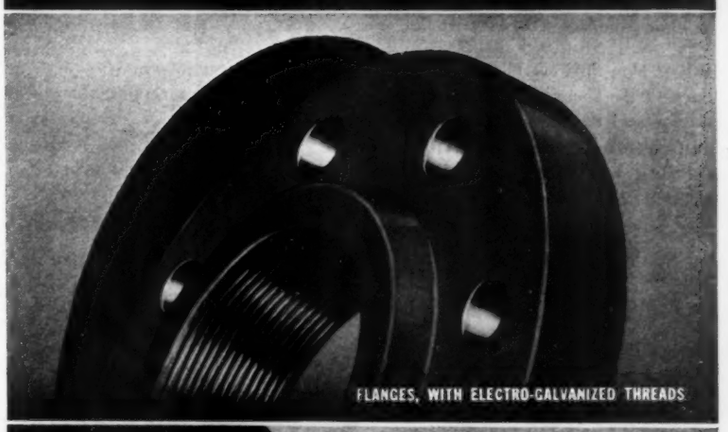
**TABLE 7—CALCULATED INDEX VALUES FOR EXPECTED SERVICE OF SUCKER ROD MATERIALS**
(Assumed peak load 30,000 lbs./sq. in. in corrosive sulphide service)

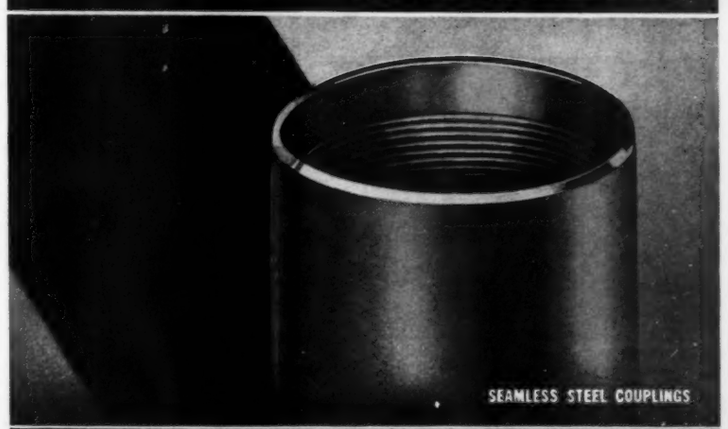
| Type— | Yield point (lbs./sq. in.) | Sulphide corrosion endurance limit (SL, lbs./sq. in.) | Index value |
|---|---|---|---|
| S.A.E. 1035 | 55,800 | 10,600 | 39.6 |
| S.A.E. 4615 | 58,500 | 19,900 | 257.0 |
| 1.25% manganese, hot rolled | 71,300 | 14,600 | 58.0 |
| 1.75% manganese, normalized | 72,900 | 12,100 | 27.7 |
| Toncan iron | 43,100 | 11,900 | 43.1 |
| Wrought iron | 42,100 | 16,400 | 106.6 |
| Nickel wrought iron | 58,100 | 18,600 | 211.0 |
| Nickel iron | 47,900 | 19,100 | 213.0 |
| Nickel molybdenum iron | 52,500 | 21,900 | 346.5 |

**TABLE 8—CLASSIFICATION OF SUCKER ROD MATERIALS ACCORDING TO SERVICE CONDITIONS**

| Type of Service | | | | | |
|---|---|---|---|---|---|
| Non-Corrosive | | Corrosive | | | |
| | | Non-Sulfide | | Sulfide | |
| Light → Heavy | | Light → Heavy | | Light → Heavy | |
| S.A.E. 1035 | S.A.E. 1050, heat treated | S.A.E. 1035 | 1.25% manganese | 1.25% manganese | nickel wrought iron |
| S.A.E. 1045 | S.A.E. 3130 | S.A.E. 1045 | 1.75% manganese | wrought iron | nickel iron |
| | S.A.E. 4130, heat treated | Toncan iron | S.A.E. 3130 | S.A.E. 4615 | nickel molybdenum iron |
| | 1.25% manganese | wrought iron | | 1.25% manganese | |
| | 1.75% manganese | wrought iron | | S.A.E. 4615 | |
| 1.25% manganese | | | | wrought iron | |

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008-20A

GENERAL ELECTRIC


# Lead and Its Alloys Fill Definite Need in Modern Petroleum Refinery

By G. O. HIERS
National Lead Co.

Lead is used in the petroleum industry both in pigment and in metallic form. As a pigment, lead monoxide or litharge (PbO) is used with caustic soda to form a sodium plumbite solution (the so-called "doctor" solution) by which the mercaptans (sulphur compounds) in unrefined gasoline and kerosene are removed. Although refiners absorb large quantities of litharge for this purpose, the oil industry makes use of even larger quantities of lead in sheet and pipe form and as a lining for tanks, pumps, valves, piping systems and the like which are subjected to the action of various corrosive acids.

In general, the lead used in oil refinery equipment is of three types; the so-called chemical lead, the most widely employed; antimonial lead; and tellurium lead. Chemical lead is practically pure metal, excepting for a small amount of copper (from .05 to .08 per cent). This lead derives its name simply because of its wide use in the chemical industry. Sulphuric acid ranging up to 60° Baume (77.7 per cent $H_2SO_4$) has but slight action upon chemical lead, even when heated near the boiling point. When more concentrated (up to 96 per cent) the action is still only slight at ordinary temperatures although it increases somewhat at elevated temperatures.

### Antimonial Lead

Antimonial lead containing 6 to 8 per cent antimony and known as hard lead is also used extensively in oil refinery equipment. The addition of even a small amount of antimony stiffens the metal and gives it greater resistance to such mechanical failures as buckling and creeping. Antimonial lead, however, does not resist the solvent action of very hot concentrated sulphuric acid as well as chemical lead and hence is not recommended in contact with the acid at temperatures above 200° C. (392° F.). Frequently antimonial lead is used in the reinforcement of chemical lead sheet. This product is known as crawl proof lead.

### Tellurium Lead

Tellurium lead, which contains only a very small amount of tellurium, is a new development and exhibits a marked change in properties from that of chemical lead. This lead has a finer grain structure, greater tensile strength, increased resistance to fatigue and greater corrosion resistance than other chemical leads. Because of its newness, fewer examples of its performance under actual service conditions are available. However, laboratory tests of a relatively severe nature have indicated that tellurium lead possesses the qualities enumerated above.

For instance, 97 per cent sulphuric acid at 300° C. which completely dissolved a nickel lead alloy in two hours caused a weight loss of only 11.52 per cent in tellurium lead after a similar length of time. For a short period, it was even able to withstand boiling sulphuric acid. In other tests with phosphoric acid, chlorine gas, impure solution of sodium sulphite and sulphur dioxide, tellurium lead showed favorably.

In addition to the above properties, tellurium lead has the remarkable quality of toughening when strained. A piece of this lead when worked, as by rolling or stretching, actually has a greater tensile strength and resistance to fracture than before. Although work-hardened tellurium lead is harder than chemical lead, this hardness is not accompanied by brittleness. A tellurium lead sheet can be bent many times and hammered at the bend without fracture.

The value of a material which strengthens under strain is perfectly obvious, especially when used in such chemical apparatus as agitator tanks where vibration stresses are encountered. Furthermore at elevated temperatures there should be a reduced tendency to sag, buckle and crawl, with a greatly diminished possibility of fracture after prolonged service.

The behavior of tellurium lead in service is being watched with considerable interest because in the past, failures of lead equipment in the chemical and petroleum industry have been due more to mechanical trouble than to corrosion. The weight loss due to corrosion is exceedingly small when figured on the basis of the total weight of lead exposed. But the damage which results when penetration (or perforation) occurs through the lining at mechanically stressed points may often be considerable. Such failures frequently occur with loose linings subject to vibration or with loose linings improperly fastened with too few straps.

When reinforced the lead sheet is usually bolted or strapped to the steel tank which it lines. Vertical straps are generally preferred. They should be numerous to avoid the possibility of buckling, due to expansion or contraction with changes in temperature. In the sulphuric acid treatment of oil in agitator tanks, special effort should be made to insure that the sheet lead linings are securely fastened. Sometimes a brick lining is used inside of a lead lining as a structural support in order to prolong the life of the lead lining.

As pointed out above, antimonial lead sheet and pipe are frequently used in preference to chemical lead sheet owing to their greater strength and adequate corrosion resistance to sulphuric acid at ordinary and slightly elevated temperatures. Very often in the construction of pumps and valves, 6 per cent antimonial lead is used because of its resistance to abrasion as well as its strength and anticorrosive quality. Tellurium lead, due to its unusual work hardening capacity, has shown less tendency toward buckling when used for loose linings in tanks. Its superior fatigue strength indicates a long life especially for equipment subjected to vibration. Furthermore, the fine grain structure of tellurium lead gives it an unusually smooth surface which is an aid in the prevention of local corrosion and pitting.

## MAJORS CUT LONG-TERM DEBT

On the whole, common stockholders of major oil companies at this date are in a better position to share quickly in any improvement in earnings which the industry may enjoy at any time in four years or more, says the Wall Street Journal. Furthermore, while their position was materially improved during the past three or four years, it is still being bettered.

The more favorable position now occupied by holders of common stocks of oil companies is the result of substantial reductions which these companies, in the aggregate, have effected during the depression, and are still effecting, in their interest and preferred dividend requirements.

During the past three or four years many of these companies applied surplus cash, on which little return could be obtained, to retire long-term debt. In addition some of the companies took advantage of the low prices obtaining for their common and preferred shares during the depression years to re-acquire substantial blocks, some of which have been cancelled while others have been re-issued to acquire new properties.

More recently, however, the large accumulation of idle funds and consequent low money rates have brought a growing number of the companies into the capital market to refund outstanding funded debt with new issues carrying a lower coupon rate.

# Market Nervousness Over Invalidation of Codes Is Disappearing in Chicago

By SPECIAL CORRESPONDENT

CHICAGO, June 8.—The oil trade in this area is beginning to express relief and to breathe freely again to find that nothing in the way of a market collapse followed the knocking out of the oil code. Nervousness which followed the Supreme Court decision has been replaced by new confidence.

Attention in the last few days has been centered in the question of how much success will attend the further stabilization efforts being made and the plans for a voluntary oil marketing code. In the meantime, the gasoline market holds firm to strong. After lengthy discussions in major company sessions and independent refiner sessions here June 6-7, much encouragement was expressed. Continuation of stabilization efforts is being planned. At a Kansas City, Mo., meeting June 13 additional discussions participated in by more of the Mid-Continent refiner group were to take place.

### Jobbers Hold Back

Jobbers have continued to defer their purchases of gasoline on the theory that ending of the federal gasoline tax June 30 is still a possibility and they do not wish to be caught with large quantities of tax-paid material. In the case of a few states, jobbers are holding off from buying until after the twentieth to escape paying taxes early. As to the federal tax, the best information available here is that it will be continued. Well-posted authorities see little chance of its elimination.

Weather has been decidedly unfavorable and seems to have cut into gallonage to a marked extent throughout May and this far in June. Temperatures are running abnormally low, with precipitation excessively heavy. Motoring is being held back. Gallonage in the event of good weather apparently would have been extremely large. Resort business in northern sections is waiting for a turn in weather.

### Retail Prices Holding

A checkup of tank wagon and service station markets throughout the central states indicates that these prices are holding about as well since the dropping of the code as before. It is being pointed out that code adherence was voluntary in any event. The firm tank car market is preventing any general break in retail, at the present time. So far as can be ascertained there is no great increase in retail deals or secret rebates. Consumer prices are not so high as to be causing much resistance from the public.

### Heating Oils

Heating oils are easing off in this region after having shown unusual late-season vitality. There is still a little delayed consumer business due to need for heat mornings and evenings. The large distributors are out pushing their contracts for the 1935-36 season, with only moderate success thus far. Some consumers say they will wait for lower prices. One distributor, however, is reported offering 2¾ cents for 100 cars of prime distillate, a higher price than he offered last year.

### Kerosene

While kerosene is ranging a little easier, the lateness of the season is expected to contribute to a stringing out of demand much later this year. Offerings as yet are moderate. It is assumed much corn in the Middle West will have to be replanted. Tractor fuels are holding, for the most part, and are subject to a good late-season demand. Stocks are not heavy on any of these products.

### Lubricants

There is now a better tone in lubricants, with prices stiffening a little. Inquiry also appears a shade improved.

### Industrial Oils

Steel business and other industrial activity continue rather disappointing. Consequently, heavy fuel movement is quite

(Continued on Page 108)

## Crude Oil Prices

(Continued from Page 28)

Humble Oil & Refining Co. and Texas Co. Effective September 20 in Salt Flat by Shell Petroleum Corp.

### Rocky Mountain States

| | |
|---|---|
| Iles light (Sept. 29, 1933) | $.95 |
| Iles, heavy (Sept. 29, 1933) | .90 |
| Florence, Colo. (June 17, 1933) | .80 |
| Fort Collins and Wellington, Colo. (June 17) | (See Salt Creek prices) |
| Big Muddy (Sept. 29, 1933) | 1.01 |
| Frannie, light (May 1, 1934) | .70 |
| Frannie, heavy (Sept. 29, 1933) | .62 |
| Salt Creek and LaBarge (Sept. 29, 1933) | |
| See Stanolind Mid-Continent price schedule | |
| Grass Creek, light (Sept. 29, 1933) | 1.18 |
| Grass Creek, heavy (Sept. 29, 1933) | .62 |
| Elk Basin (Sept. 29, 1933) | 1.18 |
| Rock Creek (Sept. 29, 1933) | 1.02 |
| Lance Creek (Dec. 16, 1932) | .92 |
| Hudson (June 2, 1931) | .65 |
| Lost Soldier (Sept. 30, 1933) | .88 |
| Hamilton Dome, all grades (Feb. 16, 1935) | .57 |
| Torchlight (Sept. 29, 1933) | 1.18 |
| Greybull (Sept. 29, 1933) | 1.18 |
| Pondera (Sept. 29, 1933) | 1.25 |
| Sunburst (Sept. 29, 1933) | 1.35 |
| Cat Creek, Montana | 1.07 |
| Hogback (Sept. 29, 1933) | 1.11 |
| Lea County, N. Mex. (Sept. 29, 1933) | .75 |
| Maljamar (Sept. 29, 1933) | .70 |
| Artesia-Jackson (Dec. 1, 1933)* | .75 |

Note—Salt Creek, Torchlight, Elk Basin, Grass Creek, Frannie, Greybull, Hogback and Iles by Stanolind Oil & Gas Co. Elk Basin, Grass Creek light, Big Muddy, Rock Creek and Sunburst by Ohio Oil Co. Lost Soldier posted by Producers & Refiners Corp. Artesia, Jackson and Maljamar posted by Continental Oil Co. Lea County, effective September 29, 1933, by Humble Oil & Refining Co. and other buyers; Fort Collins, Wellington, Orchard, Florence, Big Muddy, Cat Creek, Rattlesnake and Table Mesa by Continental Oil Co. Osage posted by Arro. Hamilton Dome, Wyo., by Stanolind Oil & Gas Co. Pondera, Mont., by Ohio Oil Co. (Stanolind Oil & Gas Co., effective January 1, 1935, posted $1 per barrel in Pondera.)

*Continental Oil Co.

### North Louisiana and Arkansas

| | |
|---|---|
| Smackover, Ark. (all grades) | $.76 |
| Tullos, Urania, La. (Jan. 12, 1934) | .87 |
| Nevada, Ark. (Sept. 29, 1933) | .60 |
| East El Dorado (Sept. 29, 1933) | .70 |
| Converse, La. (Mar. 17, 1934) | 1.02 |
| Elm Grove, La. (Sept. 29, 1933) | .75 |
| Holly, La. (Nov. 17, 1934) | 1.02 |
| Pleasant Hill, La. (Mar. 17, 1934) | 1.02 |
| Zwolle, La. (Mar. 17, 1934) | 1.02 |
| Champagnolle, Ark. (Mar. 17, 1934) | .81 |
| Lisbon, Ark. (Mar. 17, 1934) | 1.02 |
| Stephens, Ark. (Sept. 29, 1933) | .70 |
| Urbana, Ark. (Mar. 17, 1934) | .60 |
| Other fields | (See gravity table) |

Note—Smackover: Effective September 29, 1933, Texas Co., Magnolia Petroleum Co., Standard of Louisiana, Louisiana Oil Refining Corp., Gulf Refining Co. and Phillips Petroleum Co. East El Dorado posted by Magnolia Petroleum Co. and Gulf Refining Co., Navada by Standard Oil Co. of Louisiana. Urbana posted by H. L. Hunt, Inc., and Louisiana Oil Refining Co. Converse, Holly, Zwolle and Urbana by Standard Oil Co. of Louisiana; Elm Grove by Simmons Oil & Refining Co.; Pleasant Hill by Standard Oil Co. and Magnolia Petroleum Co.; Champagnolle by Standard Oil Co. and Lion Oil & Refining Co.

### Eastern States

TIDE WATER PIPE CO.
(Effective May 16, 1935)

| | |
|---|---|
| Bradford, Pa. | $2.30 |
| Allegany, N. Y. | 2.30 |

SOUTH PENN OIL CO.
(Effective May 16, 1935)

| | |
|---|---|
| Pennsylvania Grade Oil in National Transit Lines (Bradford Field) | $2.30 |
| Pennsylvania Grade Oil in Southwest Pennsylvania Lines | 1.92 |
| Pennsylvania Grade Oil in Eureka Pipe Line lines | 1.87 |
| Pennsylvania Grade Oil in Buckeye Pipe Line lines | 1.77 |
| Corning Grade Oil in Buckeye Pipe Line Co.'s lines (Oct. 2, 1933) | 1.37 |

PENNZOIL CO.
(Effective May 16, 1935)

| | |
|---|---|
| Pennsylvania Grade Oil in National Transit Lines: | |
| Group A (Includes Cochran, Franklin, Hamilton and Doolittle districts.) | $2.17 |
| Group B (Includes Titusville district.) | 2.16 |
| Group C (Includes Turkey and Tidioute districts.) | 2.15 |
| Group D (Includes Bear Creek and Porkey districts.) | 2.14 |
| Group E (Includes Eldeneau, Bull Creek, Rough Run, Carbon, Dipner, Bredlin, McJunkin, Jameson, Kennerdell, Emlenton, Tiona, Lacey and Kinzua districts. Price depends on length of pipe line haul to plant at Oil City. | 2.11 |

PURE OIL CO.
(Effective May 16, 1935)

| | |
|---|---|
| Cabin Creek, W. Va. | $1.87 |
| Bradford Hollow, W. Va. | 1.87 |
| Kelly Creek, W. Va. | 1.87 |

### Middle Western States

OHIO OIL CO.

| | |
|---|---|
| Lima (Feb. 1, 1935) | $1.15 |
| Illinois (Jan. 5, 1934) | 1.19 |
| Princeton, Ind. (Jan. 5, 1934) | 1.13 |
| Plymouth | Shut in |
| Midland, Mich. (Sept. 30, 1933)* | 1.02 |
| West Branch, Mich. | .80 |
| Oceana, Mich. (Oct. 5, 1933) | .96 |
| Somerset, Ky. (May 20, 1935) | 1.13 |
| Western Kentucky (May 22, 1935) | 1.13 |

*Posted by Pure Oil Co. and Simrall Pipe Line Co. Producers Pipe Line Co. pays 5 cents per barrel over Pure Oil Co.'s posted prices. West Branch, Mich., posted by Simrall Pipe Line Co. Somerset, Ky., crude purchased by Ashland Refining Co., Ashland, Ky., and posted prices includes premium. Oceana posted by Old Dutch Refining Co. and Naph-Sol Refining Co.

### Canada

| | |
|---|---|
| Ontario (September 9, 1933): | |
| Petrolia* | $2.10 |
| Oil Springs | 2.17 |
| Turner Valley (May 21, 1934):† | |
| Clear naphtha | $2.55 |
| Discolored naphtha | 2.37 |
| Crude oil, 50 gravity | 2.19 |
| Crude oil, 45 to 49.9 | 2.07 |
| Crude oil, 40 to 44.9 | 1.50 |

*Imperial Oil, Ltd. †Imperial Oil, Ltd., and Regal Oil & Refining Co.

### Mexico

| | |
|---|---|
| Panuco* | $1.01 |

*F.o.b. ship, based on April transactions and exclusive of production and export taxes and bar dues.

## California Crude Oil Prices

STANDARD OIL CO. OF CALIFORNIA
(Effective September 6, 1933)

For current purchases of crude oil at the well (unless otherwise specified). (All gravities above those quoted take highest price offered in that field)

| Gravity— | Long Beach | Seal Beach, Alamitos Heights | Huntington Beach | Inglewood | Playa del Rey | Olinda, Brea Canyon | Athens-Rosecrans | Torrance | Richfield | Whittier, La Habra | Montebello | Santa Fe Springs | La Habra-Coyote | Midway-Sunset, Elk Hills, Buena Vista Hills | Lost Hills | Coalinga | Coyote |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14-14.9 | $.65 | $.65 | $.65 | $.65 | $.65 | $.65 | .... | $.65 | $.65 | $.65 | $.65 | .... | $.65 | $.57 | $.57 | $.57 | $.65 |
| 15-15.9 | .65 | .65 | .69 | .69 | .66 | .69 | .... | .66 | .65 | .65 | .65 | .... | .65 | .... | .... | .. | .65 |
| 16-16.9 | .66 | .65 | .72 | .73 | .69 | .73 | .... | .69 | .67 | .68 | .65 | .... | .66 | .... | .... | .... | .65 |
| 17-17.9 | .69 | .65 | .75 | .76 | .73 | .76 | .... | .72 | .70 | .71 | .65 | .... | .68 | .... | .... | .... | .68 |
| 18-18.9 | .72 | .65 | .78 | .80 | .76 | .79 | .... | .75 | .74 | .74 | .65 | .... | .71 | .61 | .61 | .59 | .71 |
| 19-19.9 | .75 | .65 | .81 | .83 | .80 | .83 | .... | .78 | .78 | .78 | .65 | .... | .74 | .64 | .65 | .62 | .74 |
| 20-20.9 | .78 | .68 | .83 | .87 | .83 | .85 | .... | .81 | .82 | .81 | .66 | .... | .78 | .67 | .69 | .65 | .78 |
| 21-21.9 | .81 | .72 | .86 | .90 | .87 | .88 | .... | .83 | .85 | .84 | .69 | $.72 | .81 | .70 | .73 | .68 | .81 |
| 22-22.9 | .84 | .76 | .89 | .94 | .90 | .92 | .... | .85 | .89 | .87 | .72 | .76 | .84 | .73 | .76 | .72 | .84 |
| 23-23.9 | .88 | .81 | .92 | .97 | .94 | .95 | $.83 | .89 | .92 | .90 | .76 | .79 | .87 | .77 | .79 | .75 | .87 |
| 24-24.9 | .91 | .85 | .95 | 1.01 | .97 | .98 | .86 | .92 | .97 | .93 | .80 | .83 | .90 | .81 | .82 | .78 | .90 |
| 25-25.9 | .94 | .89 | .98 | .... | 1.00 | 1.01 | .90 | .95 | 1.00 | .... | .85 | .87 | .93 | .85 | .85 | .81 | .93 |
| 26-26.9 | .97 | .93 | 1.01 | .... | 1.04 | 1.04 | .94 | .98 | 1.04 | .... | .89 | .90 | .96 | .89 | .88 | .... | .96 |
| 27-27.9 | 1.00 | .98 | 1.04 | .... | .... | 1.07 | .97 | .... | 1.08 | .... | .... | .94 | .99 | .93 | .91 | .... | .99 |
| 28-28.9 | 1.02 | 1.02 | 1.07 | .... | .... | 1.10 | 1.01 | .... | 1.11 | .... | .... | .98 | 1.02 | .97 | .94 | .... | 1.02 |
| 29-29.9 | 1.06 | 1.05 | 1.09 | .... | .... | .... | 1.04 | .... | 1.15 | .... | .... | 1.01 | 1.05 | 1.01 | .97 | .... | 1.06 |
| 30-30.9 | 1.09 | 1.10 | 1.12 | .... | .... | .... | 1.08 | .... | .... | .... | .... | 1.05 | 1.09 | 1.05 | 1.00 | .... | 1.09 |
| 31-31.9 | .... | .... | .... | .... | .... | .... | 1.12 | .... | .... | .... | .... | 1.08 | 1.12 | 1.09 | .... | .... | 1.12 |
| 32-32.9 | .... | .... | .... | .... | .... | .... | 1.15 | .... | .... | .... | .... | 1.12 | 1.15 | 1.12 | .... | .... | 1.15 |
| 33-33.9 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1.16 | 1.18 | 1.17 | .... | .... | 1.18 |
| 34-34.9 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1.19 | 1.21 | .... | .... | .... | 1.21 |
| 35-35.9 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1.23 | .... | .... | .... | .... | .... |
| 36-36.9 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1.26 | .... | .... | .... | .... | .... |
| 37-37.9 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1.30 | .... | .... | .... | .... | .... |
| 38-38.9 | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1.34 | .... | .... | .... | .... | .... |

**Additional Standard Oil Quotations**

**Mountain View**—Effective July 3, 1934, the following are the prices of the Standard Oil Co. of California for its current purchases of crude oil at the well in the Mountain View Field: 14 to 19.9 degrees, 57 cents; 20-20.9, 58 cents; 21-21.9, 59 cents; 22-22.9, 61 cents; 23-23.9, 62 cents; 24-24.9, 66 cents; 25-25.9, 69 cents; 26-26.9, 72 cents; 27-27.9, 75 cents; 28-28.9, 78 cents; 29-29.9, 81 cents; 30-30.9, 84 cents; 31-31.9, 87 cents; 32-32.9, 90 cents; 33 and above, 93 cents.

**Elwood Terrace**—F.o.b. ship, 33 degrees, $1.03; 34 degrees, $1.06; 35-35.9, $1.09; 36-36.9, $1.12; 37 degrees and over, $1.15.

**Newhall**—14 degrees and over, 57 cents.

**McKittrick and Kern River**—14 degrees and over, 57 cents.

**Wheeler Ridge**—14 to 17.9 degrees, 57 cents; 18-18.9, 58 cents; 19-19.9, 61 cents; 20-20.9, 64 cents; 21-21.9, 67 cents; 22-23.9, 70 cents; 23-33.9, 73 cents; 34-34.9, 76 cents; 35 degrees and over, 79 cents.

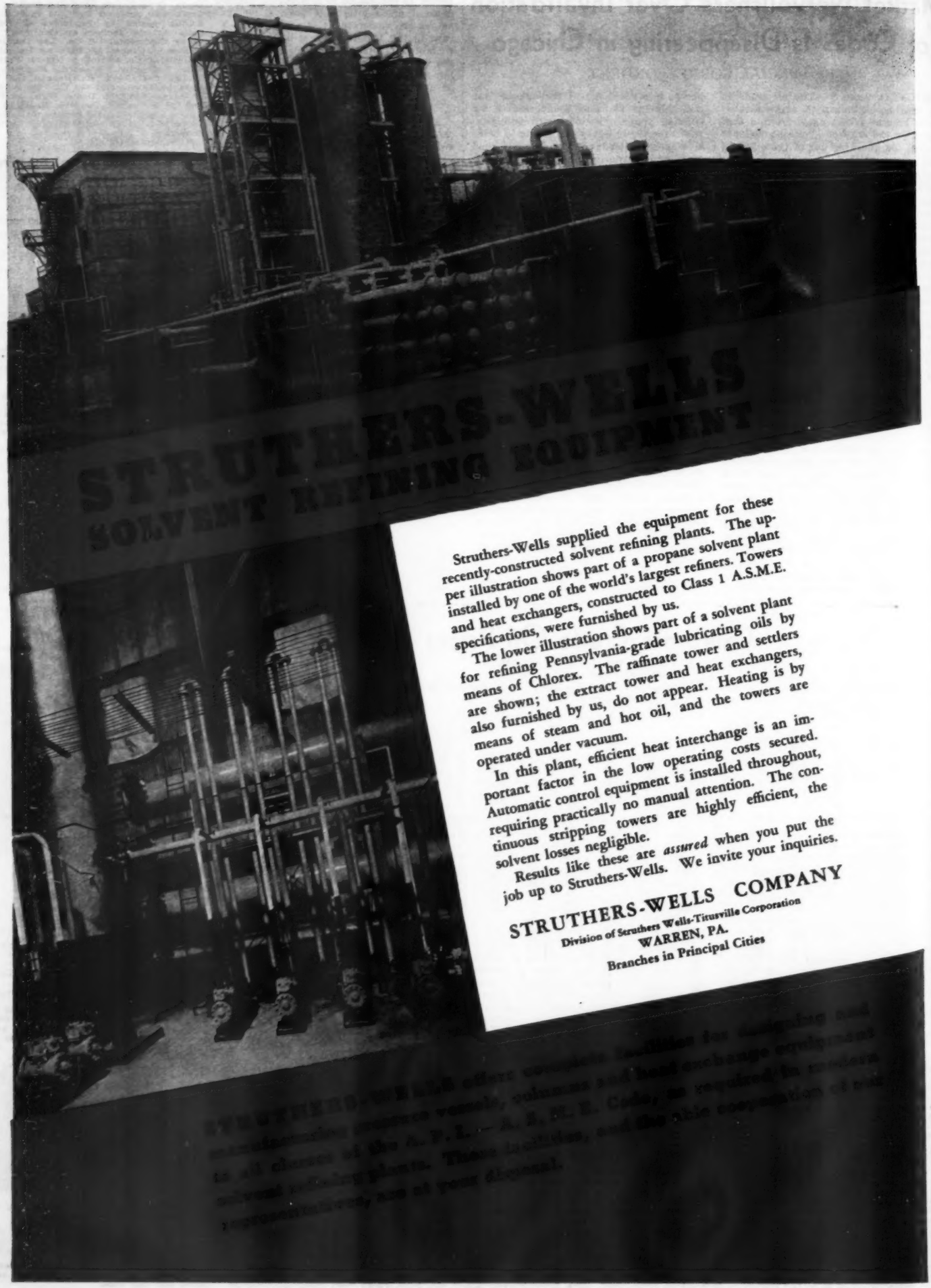
**Kettleman Hills**—33-33.9 degrees, 93 cents; 34-34.9, 96 cents; 35-35.9, 99 cents; 36-36.9, $1.02; 37-37.9, $1.05; 38-38.9, $1.08; 39 degrees and over, $1.11.

The Texas Co. posted in Shiells Canyon, South Mountain and Santa Paula as follows: 14 to 17.9, 57 cents; 3 cents added for each degree up to and including 26-26.9 degrees at 84 cents; then 4 cents added for each degree up to and including 30 degrees and over at $1. Company posts Standard Oil Co.'s Montebello prices in Montebello and North Whittier, and posts Standard Oil Co. prices in Signal Hill, Alamitos Heights, Huntington Beach, Torrance, Richfield and Santa Fe Springs, all effective September 6.

General Petroleum Co. posts Standard Oil Co. prices in Athens, Rosecrans and Signal Hill; Alamitos Heights up to 26-26.9; Santa Fe Springs up to 35-35.9; Richfield up to 25-35.9; Brea Canyon and Olinda up to 25-25.9, and Torrance up to 25-25.9.

Union Oil Co., effective September 6, posts same price as Standard Oil Co. in all fields in which both purchases, excepting that in Athens-Rosecrans, Union Oil Co. posts 21-21.9, 72 cents, and 33-33.9, $1.18; 34-34.9, $1.21, and 35-35.9, $1.24.

Associated Oil Co., effective September 6, posted same prices for the same grades as Standard Oil Co. of California, excepting that in some fields its gravity scale stops as follows: Huntington Beach, 26 degrees and over; Seal Beach and Alamitos Heights, 26 degrees and over; Coyote Hills, 23 degrees and over; Richfield, 25 degrees and over; Torrance, 25 degrees and over; Inglewood, 24 degrees and over; Santa Fe Springs, 35 degrees and over; Midway-Sunset, Elk Hills, Buena Vista Hills, 30 degrees and over. Also Associated pays 52 cents for oil of 11 to 13.9 gravity in McKittrick, Kern Front, Kern River, Midway-Sunset, Elk Hills, Buena Vista Hills and Coalinga.




Struthers-Wells supplied the equipment for these recently-constructed solvent refining plants. The upper illustration shows part of a propane solvent plant installed by one of the world's largest refiners. Towers and heat exchangers, constructed to Class 1 A.S.M.E. specifications, were furnished by us.

The lower illustration shows part of a solvent plant for refining Pennsylvania-grade lubricating oils by means of Chlorex. The raffinate tower and settlers are shown; the extract tower and heat exchangers, also furnished by us, do not appear. Heating is by means of steam and hot oil, and the towers are operated under vacuum.

In this plant, efficient heat interchange is an important factor in the low operating costs secured. Automatic control equipment is installed throughout, requiring practically no manual attention. The continuous stripping towers are highly efficient, the solvent losses negligible.

Results like these are *assured* when you put the job up to Struthers-Wells. We invite your inquiries.

**STRUTHERS-WELLS COMPANY**

Division of Struthers Wells-Titusville Corporation
WARREN, PA.
Branches in Principal Cities

# New Development East of Government Wells; Two Locations Staked in Loma Alta Area

SAN ANTONIO, Tex., June 10.—Attention was directed to the east side of the Government Wells Field in Duval County by completion of Santa Clara Oil Co.'s No. 1 Wood-Welder, NE cor. of Survey No. 385, northern Duval County, a mile south of the New Seven Sisters Field opened a few weeks ago by Henderson and Harvey's No. 1 Chernosky. Bottomed in what is thought to be a part of the lower Government Wells sand at 2,481 feet, with 7-inch casing cemented at 2,475 feet, it was swabbed in and flowed a total of 324 bbls. in 27 hours on chokes varying from three-sixteenths to one-fourth inch. On the last gauge available it was flowing 28 bbls. per hour, with tubing pressure increasing from 290 pounds to 630 pounds and casing pressure standing at 825 pounds. The oil is 22 gravity.

Santa Clara Oil Co., composed of C. W. Atkins and John T. O'Neil of San Antonio, owns the lease on 320 acres on which the well is located and one tract to the west. Humble Oil & Refining Co., which holds acreage to the north, is rigging up No. 1 Serna, a direct offset.

### Loma Alta Field

In the Loma Alta Field, extreme southern part of McMullen County, about 4 miles north of the Seven Sisters Field, opened last week by Texio Oil Co.'s No. 1 Atkinson, two locations were announced. East of the discovery, Texio Oil Co. is moving in material for No. 2 Atkinson, and Humble Oil & Refining Co. is rigging up No. 1 Atkinson, a north offset.

### Loma Novia

The Loma Novia Field, along the trend east of the Government Wells Field, is receiving the most development due to recent extensions. Production is divided into North Loma Novia and South Loma Novia. Four locations were started in the south extension area during the week, and a location has been made between the two areas which will decide if they are to be linked together. In the extreme south part, Highland Oil Co. has made location for No. 1 Hubbard, 666 feet south of the Hamil and Smith producer which extended production south the past week. Northeast about 1 mile, in Section 84, Rosan-Texla Oil Co. is moving in material for No. 2 Hubbard. In the same section and offsetting this test to the north, Humble Oil & Refining Co. is moving in material for No. 1 Hubbard on a 320-acre lease. Northwest a half mile, Duval Oil Corp. has made location for No. 1 Hahl on a 320-acre lease "farmed" by Shell Petroleum Corp. E. R. Thomas of San Antonio has staked for No. 1 C. W. Hahl, 330 feet out of the SE cor. of Section 63 in the J. Potevent Survey, midway between the two areas.

In the north part of the field, Stiern Oil Corp.'s No. 1 Vela, a southwest offset to the discovery, bottomed in oil sand last week at 2,718 feet, has been completed for an initial production of 11 bbls. per hour through a one-quarter inch choke. It is in Survey 72. In Section 73, Buchanan's No. 5 Ruiz cored saturated sand from 2,675-84 feet and has the appearance of making a good well.

### Live Oak County

Along the "Jackson trend" in Live Oak County, in the southwestern part of the county, Feltner, Lefevre and Spice's No. 1 Carter Investment Co. is drilling below 2,470 feet after topping the Cole sand at 2,360 feet which showed nothing of importance. It is reported many companies owning leases in the area have increased their holdings during the past two weeks.

Darby Petroleum Co.'s No. 1 McNeil, a south outpost test in the McNeil Field, Live Oak County, was attempting to make a drill stem test in the Hockley sand from 4,445-55 feet. The first 5 feet of sand cored was reported to have had the appearance of gas sand, while the lower 5 feet is said to have shown some saturation. North of the McNeil Field, Mills Bennett Production Co. is making location for a wildcat on a block of 2,000 checkerboarded acres. Part of the block is on the 6,000-acre Slick estate. Contract has been let to Trinity Drillers.

### Frio County

In the Pearsall area, Frio County, Amerada Petroleum Corp. made location for No. 1 Kothmann, a half mile south of production. Its No. 1 Smith, 4 miles southwest of production, failed to make a well in the Navarro sand at around 3,900 feet and is being carried to the Edwards lime. It is drilling below 4,375 feet.

### San Patricio County

Ten miles northeast of Sinton in the Plymouth Field, San Patricio County, Plymouth Oil Co. is moving in material for No. 4-C Welder, 933 feet east of Heep Oil Corp.'s No. 1-E E. H. Welder, completed in a new sand the past week and looked upon as one of the most important discoveries in the area for some time. Heep Oil Corp. is moving in material for No. 2-E Welder, 933 feet south of No. 1-E Welder in Section 46. In the latest completion gauge made of the discovery well it flowed at the rate of 42 bbls. per hour, an increase of about 23 bbls. per hour.

Although no production gauge was available on Plymouth Oil Co.'s No. 3-C Welder, north of the discovery well, it is reported to have been completed for a good well. It was completed in sand from 5,486-5,501 feet and started flowing after being swabbed. No. 2-C Welder, 1,320 feet east of No. 1-E, is preparing to cement casing after coring oil sand from 5,621-36 feet, total depth. It is reported casing will be perforated from 5,621-36 feet.

### Saxet

In the Saxet Field, Nueces County, Houston Oil Co. completed No. 3 Rand Morgan for a quarter-mile extension, when it made 470 bbls. per day through a one-quarter inch choke. Sand was cored from 4,864-76 feet, total depth. Derricks are being built for two more tests.

### Webb County

Location is to be made for a wildcat on a block of 30,000 acres in Webb County assembled by W. H. Vernor, representing Austin and Vernor of San Antonio. The block includes the ranch of the late H. H. Jeffries, 30 miles northwest of Laredo, and permit has been granted for drilling of W. H. Vernor, trustee's No. 1 Jeffries, 6,750 feet from the east line and 1,170 feet from the south line of Survey No. 1,453. Drilling is scheduled to get under way by July 1.

### Bee County

Although official gauges are not available, three wells in the Dirks Field, Bee County, are reported to have been completed for good producers within 48 hours. Dirks Brothers' No. 2 R. C. Harris was completed in sand from 3,889-3,904 feet, total depth. Mills Bennett Production Co.'s No. 1-B Bassinger was completed in sand from 3,861-73 feet and Home Oil Co.'s No. 3 Bassinger was completed in sand from 3,827-38 feet.

Wildcatting in Bee County was increased by three tests. Seven miles west of Beeville, Mills Bennett Production Co. and others are rigging up No. 1 I. G. Miller, 330 feet out of the NE cor. of the Miller 661-acre tract in the C. Rivas Survey. Four miles southeast of Beeville, George M. Church is moving in material for No. 1 J. C. Wood, 330 feet from the northeast and northwest lines of the Wood 427.7-acre tract in the John Ryan Survey. Actual drilling was to get under way on Humble Oil & Refining Co.'s No. 1 J. C. Wood, 13 miles southeast of Beeville, and 1 mile northeast of the company's No. 2 Thompson, abandoned a few weeks ago.

## Wildcat Operations in Southwest Texas

**Week Ending June 8**

**BANDERA COUNTY**

Plateau Oil Co.'s No. 1 Garrison, G.C.&S.F. Sur. No. 506, 1,500 ft. from W and 2,970 ft. from N lines of survey.
Standing 3,409 ft.

Palm Winn Oil Co.'s No. 1 Watson, Sur. No. 71 (workover).
T.D. 1,700 ft.; reaming.

**BASTROP COUNTY**

Malone & Owens' No. 1 Spooner, 500 ft. from N line, 3,550 ft. from SW line of Leverenz Sur.
Lime 2,158-68 ft.; making D.S. test.

**BEE COUNTY**

Bennett & Calloway's No. 1 Miller, 330 ft. from E line, 937 ft. from N line of 6.74-ac. tract, C. Rivas Sur.
Rigging up.

Dirks Bros. and McMurry's No. 1 Johnson, 1,050 ft. S line, 150 ft. E line of tract, Uranga grant.
Derrick.

Dirks Bros. et al's (Daugherty et al) No. 1 Hicks, N 70 deg. 40 ft. W 975 ft. from E line, N 19 deg. 38 ft. E 1,361 ft. from S line, NW cor. Blk. 45, Uranga grant.
T.D. 3,965 ft.; perfotated csg. 3,613-30 ft.; swabbing.

Firm Oil Co.'s No. 1 Copeland, 1,650 ft. from N line, 330 ft. from E line of lease, B. O. Hadley Sur.
Set csg. 250 ft.; resumed drlg.

G. M. Church's No. 1 J. C. Woods, 330 ft. from N line, 330 ft. W of road, J. Ryan Sur.
Moving in material; S.D.

Humble O. & R. Co.'s No. 1 Wood, 466 ft. out of SE cor. of 3,000-ac. tract, Wm. Burke Sur.
Rigging up.

Humble O. & R. Co.'s No. 2 Thompson, 466 ft. SW of SE cor. of J. C. Wood tract, 466 ft. SW on line parallel to E line, Wm. Burke Sur.
Running csg. 5,690 ft.

Francis P. Hynes' No. 1 Theo. M. Plummer, 330 ft. from W line, 990 ft. from S line of Sec. 33, Theo. M. Plummer Subd.
S.D. 1,550 ft.

Fehmont Corp.'s No. 1 T. J. Ernest, 466 ft. from SE. cor. of J. C. Madray 214-ac. tract, thence 466 ft. NW along survey line, thence S. of B/A 466 ft. Bee County School Sur.
Abd. 6,340 ft.

**BEXAR COUNTY**

Cherokee Drlg. Co.'s No. 1 Chapman, 2,100 ft. from S line, 3,200 ft. from E line, A. J. Leslie Sur.
S.D. 400 ft.

Jas. B. Cunningham's No. 1 L. F. Ridder 950 ft. S of Nelson Road, 1,300 ft. from E line, Block 5,196, Sur. No. 58.
Fishing 1,050 ft.

Jones & Kieffer's No. 1 LaGrane, NW cor. of tract, 210 ft. each way, F. Rolen Sur. No. 48.
T.D. 1,010 ft.; bailed some 38.3 gravity oil; S.D.

McPhee & Briggs' No. 1 F. Lamb, 9,200 ft. from S line, 800 ft. from W line of Sur. No. 3 (Manuel de Luna).
Shale 2,135 ft.; S.D.

Mid-Texas Prod. Co.'s No. 1 C. G. Walker, cor. of Lot 21, 1½ miles E of Shadowland.
Moving in.

Thelma O. & G. Co.'s (Noble & Akins) No. 1 DeVilbiss.
T.D. in Taylor 2,238 ft.; showing oil; S.D.

Carroll C. Raborn's No. 1 Claude McCauley, 150 ft. from N and NW lines of tract in Sec. 52, Wm. Harrison Sur.
Drlg. sand showing some oil, 660 ft.

C. C. Raborn's No. 1 A. B. Stephens, 1,630 ft. from N line, 1,540 ft. from W line of tract, P. B. Hayes Sur. No. 3.
Moving in rotary; T.D. 400 ft.; shale.

Rowan & Nichols Oil Co.'s No. 1 Zigmund, 2,250 ft. WE line, 1,750 ft. NS line, A. Deffenbaugh Sur.
Edwards lime 1,706-58 ft.; tested sulphur wtr.; abd.

**BLANCO COUNTY**

H. T. Roe and W. E. Nixon's No. 1 Polk Morrow, 2,000 ft. from W line, 1,000 ft. out of SE cor., 1,800 ft. from N line of Thomas H. Webb Sur. No. 91.
Spudded.

**CALDWELL COUNTY**

Ogden & Reed's No. 1 Mrs. H. Brewer, 1,000 ft. from NE line, 150 ft. from SE line of tract in Martinez Sur.
T.D. 1,601 ft.; P.B. 1,525 ft.; show oil 1,474-1,526 ft.; cmtd. 4½-in. csg. 1,470 ft.

**DUVAL COUNTY**

Humble O. & R. Co.'s No. 1 Davidson, 2,770 ft. S line, 330 ft. W line of Sur. 90.
Rigging up.

Intrepid Oil Co.'s No. 1 Parr, 330 ft. from N and W lines of 80-ac. tract, Sur. 115.
Temp. S.D. 6,305 ft.; may set csg. on showing had at 4,970 ft.

Magnolia Pet. Co.'s No. 2 Bennett, 337.5 ft. from S line, 664 ft. from E line of Sec. 432, S.K.&K. Sur.
Rigging up.

J. J. O'Byrne's No. 1 Ball, 330 ft. from S and W lines of Tract 3, Santas Flores grant.
Drlg. 800 ft.

(Continued on Page 110)

## Net Increase of 211 Drilling Wells in May

Completed wells in May in the fields east of California numbered 265 more than in April. There were 54 fewer drilling wells at the close of May than the close of April, which, subtracted from the 265 increase in completed wells, indicates a net gain of 211 in drilling operations in May. Following is the summary:

**SUMMARY OF ALL FIELDS**

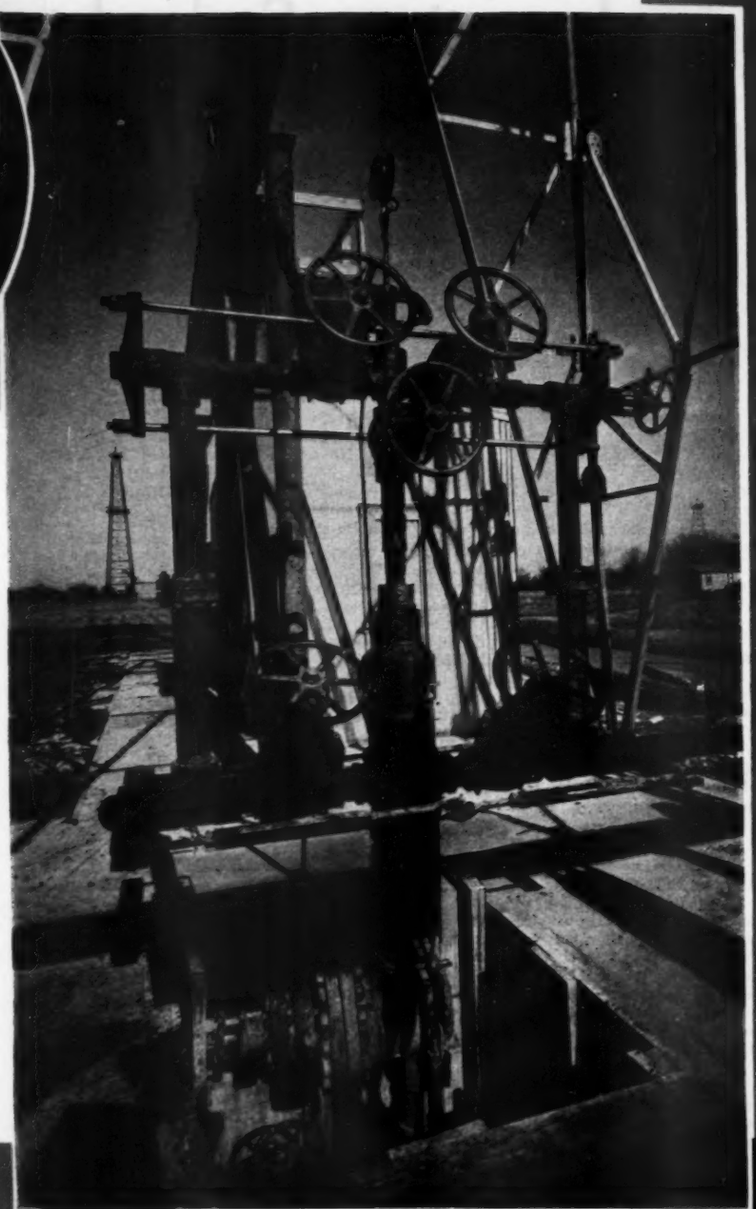
**Wells Completed**

| | Comp. | Prod. | Dry | Gas |
|---|---|---|---|---|
| Pennsylvania Grade | 281 | 665 | 32 | 45 |
| Lima | 6 | 25 | 2 | 2 |
| Central Ohio | 12 | 121 | 4 | 4 |
| Indiana | 17 | 50 | 10 | 6 |
| Kentucky | 24 | 913 | 7 | 3 |
| Michigan | 35 | 5,008 | 10 | 9 |
| Kansas | 125 | 63,650 | 35 | 2 |
| Oklahoma | 235 | 57,752 | 77 | 11 |
| North Central Texas | 250 | 9,724 | 116 | 2 |
| West Texas | 67 | 16,913 | 17 | 1 |
| Texas Panhandle | 55 | 38,921 | 4 | 6 |
| East Central Texas | 24 | 616 | 15 | 1 |
| East Texas | 504 | 28,336 | 7 | 0 |
| East Texas (gas field) | | | | |
| Gulf Coast Texas | 81 | 26,259 | 24 | 1 |
| Southwest Texas | 118 | 13,556 | 48 | 2 |
| North Louisiana | 26 | 615 | 13 | 6 |
| Gulf Coast Louisiana | 26 | 15,414 | 8 | 1 |
| Arkansas | 18 | 971 | 9 | 0 |
| Mississippi | 2 | 0 | 1 | 1 |
| Colorado | 2 | 3,408 | 0 | 0 |
| Montana | 9 | 1,012 | 0 | 1 |
| New Mexico | 23 | 61,021 | 5 | 0 |
| Wyoming | 5 | 360 | 2 | 0 |
| Utah | 1 | 0 | 1 | 0 |
| Total May | 1,946 | 345,310 | 447 | 104 |
| Total April | 1,681 | 335,236 | 360 | 129 |
| Difference | 265 | 10,074 | 87 | 25 |

**Rigs and Wells Drilling**

| | Rigs | Dig. | Ttl. |
|---|---|---|---|
| Pennsylvania Grade | 80 | 221 | 301 |
| Lima | 4 | 36 | 40 |
| Central Ohio | 13 | 56 | 69 |
| Indiana | 0 | 37 | 37 |
| Illinois | 0 | 9 | 9 |
| Kentucky | 5 | 23 | 28 |
| Michigan | 113 | 134 | 247 |
| Kansas | 41 | 194 | 235 |
| Oklahoma | 65 | 472 | 537 |
| North Central Texas | 56 | 226 | 282 |
| West Texas | 67 | 200 | 267 |
| Texas Panhandle | 57 | 145 | 202 |
| East Central Texas | 22 | 45 | 67 |
| East Texas | 170 | 209 | 379 |
| East Texas (gas field) | 2 | 13 | 15 |
| Gulf Coast Texas | 36 | 136 | 172 |
| Southwest Texas | 26 | 130 | 156 |
| North Louisiana | 35 | 65 | 100 |
| Gulf Coast Louisiana | 18 | 80 | 98 |
| Arkansas | 11 | 32 | 43 |
| Alabama | 1 | 3 | 4 |
| Mississippi | 2 | 13 | 15 |
| Montana | 12 | 63 | 75 |
| Wyoming | 14 | 62 | 76 |
| Colorado | 4 | 27 | 31 |
| New Mexico | 15 | 105 | 120 |
| Utah | 1 | 12 | 13 |
| Florida | 0 | 2 | 2 |
| Total May | 870 | 2,748 | 3,618 |
| Total April | 921 | 2,802 | 3,723 |
| Difference | 51 | 54 | 105 |

# A.. WESTCOTT HOOKUP *Factory Built*



## Providing a Safe Way of Controlling Oil Wells

THE Westcott Xmas Tree Hookup, shown here, is factory built and tested.

This hookup offers a safe and economical way to bring in and control wells of any depth and pressure.

Westcott has many designs in stock from which a selection can be made.

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# Locations Are Gaining in West and North Texas; All-Time High in Drilling Being Expected

By L. E. BREDBERG
Fort Worth Bureau, The Oil and Gas Journal

FORT WORTH, Tex., June 10.—Locations in the West Texas district continue to gain. At present there are 253 operations in the district. This week 22 more locations were staked, 8 being for wildcat or semiwildcat tests in various counties. An all-time high in drilling operations is scheduled to be made in the near future.

There were 13 tests completed this week, 4 dry wildcats, 2 in shallow areas in McCulloch County. Reagan and Upton Counties each added a dry hole.

### Garza County Wildcat

The wildcat of N. L. Richards on the Sullivan ranch, in Section 3, Block 5, Aycock Survey, 1½ miles south of the town of Post, in Garza County, at total depth of 2,940 feet made 40 bbls. in 40 minutes while setting casing. Acid is to be run. Other tests will no doubt be drilled.

### Wildcat Locations

L. G. Stogner and others, who recently completed a dry hole in northern Andrews County, are preparing to drill another wildcat in that area. No. 1 Mrs. Carrie George, Section 25, Block A-22, P.S.L. Survey. It is approximately 3½ miles northeast of Whalenmaier Petroleum Corp. and others' No. 1 Cox Estate in Section 8, Block A-33, a test now drilling.

H. L. Holloway has made location for an extreme wildcat in the southeast end of Crane County, southwest of McCamey, and is already drilling. It is in Section 17, Block 35, H.&T.C. Survey.

Another wildcat in Ector County has been staked by Landreth Production Co. on the Blakney lands in Section 22, Block 44, Township, 1n, T.&P. Survey, 1¼ miles east of the same owner's small producer on the Cowden lands and 3½ miles north of the recent discovery of Gulf Production Co. on the Goldsmith lands. It is about three-quarters of a mile northwest of a dry hole drilled by Penn and others in Section 27, same block and survey, which went to 4,390 feet.

Three outpost tests in the Iatan Field, eastern Howard County, are preparing to get under way. Eastland Oil Co.'s No. 1 O. H. Snyder in Section 28, Block 30, Township 1s, T.&P. Survey; Texas Co.'s No. 1 O. Schalk, in Section 18, Block 19, Lavaca Navigation Co. Lands, and Wooten's No. 1 Blank in the NW¼ of Section 46, Block 30, Township 1n, T.&P. Survey.

Moutray and King have staked location for a wildcat 5 miles north of Hawley in Subdivision 1, G. Martinez Survey, northern Jones County, and are drilling. Mr. Moutray has a small refinery at Hawley operating on the sweet crude produced from wells in that area.

Pecos County also got a wildcat location this week. W. Hicks is preparing to drill in Section 106, Block 10, H.&G.N. Survey.

### Reagan County

Byrd-Frost, Inc. of Dallas have abandoned No. 1 Boyd in Section 6, Block E, L.V.S.&V. Survey, in the northern part of Reagan County, at a total depth of 1,334 feet. Elevation is 2,669 feet. Dobbs Oil Co. is pouring acid in No. 1 Friend, in Block 3, William Allen Survey, south of Big Lake in Reagan County, and expects to make some kind of well from showings at intervals between 2,325-55 feet. The oil tested 33 gravity. An increase was logged at 2,385 feet. Three bailers of sulphur water encountered at 2,464 feet caused the hole to be plugged back before treating with 1,500 gallons of acid.

### Crockett County

A wildcat getting under way in Crockett County is to be drilled by Adkins Brothers on the Shannon ranch northwest of Ozona, in Section 27, Block WX, G.C.&S.F. Survey, midway between Stanolind Oil & Gas Co.'s No. 2 Todd, shallow producer, and Leslie Hiller and others' No. 1 Todd in Section 26, Block WX, which is fishing at 715 feet.

### Crane County

Gulf Production Co.'s No. 1 McKnight, a wildcat in western Crane County, Section 9, Block B-21, is drilling at 3,230 feet making 2½ bbls. of oil per hour. It is about 4 miles northwest of Cranfill and Gulf Production Co.'s small producer in Section 9, on the Tubbs ranch, and may prove an extension or the opening of another field. It had a showing of oil from 2,895-2,902 feet and logged an increase from 3,188-3,200 feet and from 3,243 to 3,257 feet. Elevation is 2,679 feet.

### Ector County

Another interesting outpost test for Ector County will be Sun Oil Co. and Atlantic Oil Producing Co.'s No. 1 Holt, in the SW cor. Section 5, Block 43, Township 1n, T.&P. Survey. It is about one-half mile south of the Andrews-Ector County line and 2 miles northwest of Landreth Production Co.'s producer on the Holt lands, in Section 15. If it proves a producer it will support the contention that the Cowden Field in northern Ector County will connect with the Ford Pool in southern Andrews County, nearly 10 miles northwest. No dry holes stand between the two.

### Ector Pipe Line

Gulf Pipe Line Co. started laying 17 miles of 6-inch line to connect its State-A pumping station in the Penn Field to the Gulf Production Co.'s recently completed discovery on the Goldsmith lands in Section 10, Block 44, Township 1s, T.&P. Survey. About two weeks will be needed to lay the old screw line that has been taken up in East Central Texas.

### Winkler Wildcat

K-D Oil Co. has staked location for a rank wildcat in southern Winkler County, in the NE ¼ of Section 23, Block B-10, P.S.L. Survey, 5 miles east of Richardson's No. 1 Hill, small extension producer to the Halley Pool, in Section 18, Block B-11.

## RANGER AND WICHITA FALLS

There were 72 locations staked in the Ranger and Wichita Falls districts during the week. Some counties that have not witnessed any activities for three or four years are getting a play and old producers are being deepened. There were 46 tests completed in the Wichita Falls district this week, 21 proving dry.

### Leasing Activities

C. F. Carter of Dallas has taken a 2,500-acre block in Cooke County centering in the SW ¼ of the George Dooley Survey and is to drill a 2,500-foot test within 90 days. Texas Co. has assembled 500 acres in the E. Arnold Survey, on the lime high, for testing. There are dry holes to the east, west, southeast and southwest drilled to 1,500 and 1,635 feet.

W. Bradstreet of Fort Worth has assembled 800 acres centering in the SW ¼ of the J. W. Littleton Survey, 1 mile southwest of Muenster, and is to drill a 2,500-foot test within 60 days. The block is 1 mile south of production.

Cambrian Oil Co. of Oklahoma has taken a 1,000-acre block centering in the SW ¼ of the A. Van Slyke Survey, and will probably drill in the near future.

Walter Guffie has taken leases on 3,000 acres centering in the M. G. Carico Survey and is to spud a test within 60 days, to go to 2,500 feet.

### Deepening Old Wells

Deepening of old wells in the old Electra Field, Wichita County, has resulted in increased production by the logging of deeper pay sands and limes and considerable drilling in quest of these new pay horizons will no doubt result. R. R. Clark and others' No. 40 Bickley, in the center of the shallow production in the N half of Section 2, C.&M. Survey, encountered saturated lime at 1,872-84 feet and 1,888-1,905 feet and oil sand from 1,956-73 feet. It swabbed 165 bbls. of oil in 24 hours and is pumping 80 bbls. per day. It was formerly producing but a small amount of oil.

In Archer County, Grove and Wood have developed a deep well 4 miles southwest of the Chalk Hill Pool in which there are wells producing from the deeper pays found at 2,250 and 3,600 feet. These operators' No. 1 Archer County, in the SE Section 182, Thomas Glass Survey, logged oil sand from 2,830-32 feet and from 2,832-37 feet, the well making a 10-bbl. 40 gravity head of oil in 10 minutes when opened after standing over night. It is shut in for storage. A second test will be drilled to the south.

Iron Mountain Oil Co. and K. R. Marsh, both of Fort Worth, are drilling on a wildcat 6 miles northeast of Moran and 2½ miles south of the Ibex Pool in Shackelford County, on the Jim Cottle ranch in the NW Section 15, Bayland Orphan Home Lands Survey. It is in quest of the 2,100-foot Moran sand.

(Continued on Page 107)

## Wildcat Operations in West Texas

Week Ended June 8

**ANDREWS COUNTY**

Fuhrman Pet. Corp.'s No. 2 Ford, 440 ft. from S and 1,320 ft. from E, Sec. 16, Blk. A-43.
T.D. 4,012 ft.; U.R. csg.

Honolulu & Llano Oil Co.'s No. 1-B Parker, 440 ft. from N and 1,650 ft. from E, Sec. 11, Blk. A-42.
Elev. 3,281 ft.; setting csg. at 4,327 ft.

Humble Oil & Ref. Co.'s No. 4 Means, 1,982 ft. from N and 660 ft. from E, Sec. 12, Blk. A-35.
Rigged up.

Humble Oil & Ref. Co.'s No. 4 Means, 654 ft. from S and 1,997 ft. from W, Sec. 4, Blk. C-45.
Elev. 3,185 ft.; running tubing; T.D. 4,031 ft.

Republic Prod. Co.'s No. 1 Boner-State, 2,200 ft. from S and 1,320 ft. from E, Sec. 25, Blk. A-42.
Drlg. 2,869 ft.

L. G. Stogner et al's No. 1 Mrs. C. George, 660 ft. from S and E, Sec. 25, Blk. A-22, P.S.L. Sur.
Cellar.

J. W. Tripplehorn's No. 1 Ogden, 330 ft. from S and 2,310 ft. from W lines of Sec. 6, Blk. A-46, P.S.L. Sur.
Elev. 3,211 ft.; drlg. 1,580 ft.

Wahlenmaier et al's No. 1 Odessa Ranch Co., 1,320 ft. from N and E of Sec. 10, Blk. A-32, P.S.L. Sur.
Elev. 3,307 ft.; S.D. 3,410 ft. for repairs.

Wahlenmaier et al's No. 1 Cox Estate, 1,320 ft. from N and W of Sec. 8, Blk. A-33.
Rotary rig.

**BREWSTER COUNTY**

F. C. Dodson's No. 1 Texas American Syndicate, 660 ft. from N and E, Sec. 66, Blk. 10, G.H.&S.A. Sur.
Elev. 4,228 ft.; S.D. 950 ft.; rigged up rotary.

Joiner et al's No. 1 McIntyre, 353 ft. from S, 2,390 ft. from E of Sec. 21, Blk. 352, W. M. Mitchell Sur.
S.D. 2,150 ft.

King & Franklin's No. 1 Gage Est., C Sec. 133, Blk. 22, G.H.&S.A. Sur.
Elev. 4,244 ft.; S.D. 1,185 ft.

G. H. Storey's No. 1 Wilson, 1,980 ft. from N and E lines of Sec. 3, Blk. 212, T.&St.L. Sur.
Elev. 3,609 ft.; S.D. 1,245 ft.

S. G. Smith's No. 1 Decie, 2,490 ft. from S and E, Sec. 7, Blk. 1.
Elev. 4,271 ft.; fishing 1,010 ft.

**COCHRAN COUNTY**

Kelsey's No. 1 Slaughter, C Labour 36, League 150, R.C.S. Lands.
Derrick.

West Texas Development Co.'s No. 1 Slaughter, near C of Labour 52, League 149, Randall Co. School Lands.
Derrick.

**COKE COUNTY**

Haggerty et al's No. 1 Gaston, 340 ft. from S and 654 ft. from W, Sec. 11, Jos. Young Sur.
C.O. 3,037 ft.

**CRANE COUNTY**

Cranfill Bros.' No. 1 Tubbs, 330 ft. from S and W of Sec. 11, Blk. B-27, P.S.L. Sur.
Elev. 2,536 ft.; drlg. 3,142 ft.; show oil 2,975-79 ft.

Dobbs Oil Co.'s No. 1 J. Cowden et al, 330 ft. from S and E of N half, Sec. 38, Blk. 1, H.&T.C. Sur.
Drlg. 150 ft.

Gulf Prod. Co.'s No. 10 Waddell, C NW ¼ Sec. 11, Blk. B-23.
Drlg. 280 ft.

Gulf Prod. Co.'s No. 1 Henderson, 1,313 ft. from S and 1,322 ft. from E, Sec. 3, Blk. B-23, P.S.L. Sur.
Elev. 3,778 ft.; drlg. 3,100 ft.

Gulf Prod. Co.'s No. 1 M. B. McKnight, 660 ft. from S and W, Sec. 9, Blk. B-21.
Elev. 3,679 ft.; drlg. 3,230 ft.; making 2½ bbls. oil per hour.

Gulf Prod. Co.'s No. 1 Waddell, C NW NW Sec. 4, Blk. B-27, P.S.L. Sur.
S.D. 4,595 ft.

H. L. Holloway's No. 1 Mayberry, 2,440 ft. from SW and SE, Sec. 17, Blk. 35, H.& T.C. Sur.
Drlg. 125 ft.

Magnolia Pet. Co.'s No. 1 Edwards, 330 ft. from S and 1,650 ft. from E, Sec. 2, Blk. B-23.
Elev. 2,778 ft.; drlg. 2,300 ft.

**CROCKETT COUNTY**

Adkins Bros.' No. 1 Shannon, 320 ft. from S and 630 ft. from W of 80 in SW ¼ Sec. 27, Blk. WX, G.C.&S.F. Sur.
Location.

Leslie-Hiller et al's No. 1 Todd, 1,200 ft. N and 330 ft. E, Sec. 26, Blk. WX, G.C.& S.F. Sur.
Fishing 715 ft.

Humble Oil & Ref. Co.'s No. 1 Couch, C NW Sec. 3, Blk. QR, G.C.&S.F. Sur.
Temporarily abnd. 1,881 ft.; elev. 2,538 ft.

**CULBERSON COUNTY**

Anderson-Prichard Oil Corp., Magnolia Pet. Co. et al's No. 1 Borders, 1,255 ft. N and 2,305 ft. from W, Sec. 34, Blk. 69, P.S.L. Sur.
Straightened crooked hole 1,645 ft.

Miller Bros.' No. 1 fee, 1,900 ft. from N and 660 ft. from E line of Sec. 21, Blk. 97, P.S.L. Sur.
S.D. 2,137 ft.

**DAWSON COUNTY**

Adams & Turner's No. 1 John Robinson, 1,320 ft. from N line, 1,320 ft. from W line of Sec. 46, Blk. M, E.L.R.R. Sur.
Cleaning out 4,860 ft.

O. P. Dickinson, trustee's No. 1 C. H. Doaks, 368 ft. from S and 330 ft. from E of SW cor., Sec. 4, Blk. H, E.L. Ry. Co. Sur.
S.D. 155 ft.; new hole.

**ECTOR COUNTY**

Atlantic Oil Prod. Co.'s No. 1 T. P. Land Trust, 440 ft. from N and W of SE Sec. 11, Blk. 43, Twp. 1s, T.&P. Sur.
T.D. 4,391 ft.; plugged back to 4,255 ft.; testing.

Continental Oil Co.'s No. 1 Wight, 2,200 ft. from S and W, Sec. 21, Blk. 43, Twp. 1s, T.&P. Sur.
Rig.

Empire Gas & Fuel Co.'s No. 1 Cummins, 440 ft. from S and E, Sec. 10, Blk. 45, Twp. 1n, T.&P. Sur.
Fishing 4,130 ft.

Eppenauer Drlg. Co. et al No. 1 Wight, 440 ft. from N and W of NE ¼ Sec. 22, Blk. 43, Twp. 1s, T.&P. Sur.
Derrick.

Landreth Prod. Co.'s No. 1-B Blakney, 440

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# DM steel still tubes

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# NEWS FOR PETROLEUM REFINERS

## Single Unit Will Refine 65,000 Bbls. Crude Daily

NEW YORK, June 10. — The Anglo-Persian Oil Co. has let a contract for the installation of the largest single crude distillation unit ever constructed. The unit will have a capacity of 65,000 bbls. daily and will be installed at the company's Abadan, Persia, refinery. The light products will be topped from the crude overhead in a vacuum operation. The unit will be built by E. B. Badger and furnished by Englished concerns. The Abadan refinery has a crude oil capacity of 125,000 bbls. daily.

### OLD DUTCH ADDS OFFICERS

MUSKEGON, Mich., June 10.—New officers, including two Muskegon men, have been named by the recently re-organized Old Dutch Refining Co., now a $1,000,000 Michigan corporation.

John Borden, former prominent Chicago financier, and Guilford Shaw Turner, Jr., have been renamed president and vice president, the former also serving as general manager and the latter in charge of sales.

Omar P. Stelle, formerly executive vice president of the A. E. Pierce Co. of Chicago, was elected treasurer, succeeding G. B. Treloar. Mr. Stelle has been associated with the Bankers Trust Co. here for some time in an advisory capacity and will continue this work.

George A. Parmenter, a local attorney, is the new secretary, succeeding Willard G. Turner, Jr., while F. H. Duggan was named assistant secretary and director. U. deB. Daly, former president of the Shell Petroleum Corp. of St. Louis, Mo., and Ward C. Pearl of American Mineral Spirits Co., Chicago, large distributors of naphthas and other crude oil products, complete the board.

The Old Dutch Co., organized in 1929 as a Delaware Corp., erected the first refinery in Michigan.

### TIDE WATER LUB GUIDE

NEW YORK, June 8.—What is stated to be the most complete lubrication guide ever issued for all kinds of motor vehicles and boats is being distributed to dealers and service stations by the Tide Water Oil Co.

It is known as the Veedol lubrication guide and in addition to the regular charts on how to oil all models of all passenger cars made in the United States during the past four years, it also gives instructions on how properly to lubricate taxicabs, motorcycles, motor coaches, tractors, outboard motors, motorboat engines, aircraft engines and motor trucks.

### J. R. FLYNN COUNSEL

WASHINGTON, D. C., June 10.—Beginning an intensive drive to insure profitable marketing of petroleum products, following the collapse of the N.R.A., the National Oil Marketers Association has retained the services of Joseph R. Flynn, of Washington, D. C., as public relations counsel.

### GASOLINE PIPE LINE

WASHINGTON, D. C., June 12.—A bill by Representative Disney, of Oklahoma, to grant the Phillips Pipe Line Co. right of way for a gasoline pipe line at Jefferson Barracks, Missouri, was passed by the House and sent to the Senate.

### VANCOUVER REFINERY

VANCOUVER, British Columbia, June 8.—Announcement is made that Standard Oil Co. of California has bought a 40-acre site on Burrard Inlet near Vancouver and will erect an oil refinery, to be in operation this fall.

## N.P.A. Fire and Safety Marshals Hold Annual Meeting at Oil City, Pa.

OIL CITY, Pa., June 10.—An earnest plea for continued advancement in fire and accident prevention work was voiced by J. H. Herbert, Socony-Vacuum Oil Co., retiring president of the Fire and Safety Marshals of the National Petroleum Association at that group's tenth annual meeting here. Mr. Herbert cited the 1934 record of the oil industry of one worker of every 28 being injured and of 42.1 fatalities per 100,000 workers. While stating that these figures are a remarkable improvement, he added, "But we can't stop here because if we look at these records by themselves, without comparison with the past, they are startling figures."

Mr. Herbert reviewed accident and fatality statistics to show that the oil industry has risen from a position far behind industry as a whole to a point, in 1933, where its injuries were 58 per cent less frequent than in 1927 and 12 per cent less severe than in all industries.

The meeting opened with 175 representatives of companies affiliated with the National Petroleum Association in attendance. Other speakers were L. D. Fulton, Pennzoil Co., Oil City; R. S. Bonsib, Standard Oil Co. (New Jersey); C. W. Fick, General Electric Co., Cleveland, and J. J. Forbes, U. S. Bureau of Mines, Pittsburgh.

Mr. Fulton discussed "Responsibility of Foremen and Employes for Fire and Accident Prevention."

"It is emphatically the duty of the foreman to maintain a high standard of production and to keep costs within a fixed estimate," Mr. Fulton said. Since the most successful foreman is the one whose department shows the most production at the lowest relative cost it is to his advantage to guard against accidents.

"Safeguarding Hazards Introduced by Improved Refinery Operations," was discussed by Mr. Bonsib, chief safety inspector of Standard Oil Co. (New Jersey). Mr. Bonsib said, "Due to the narrow margin of profit on which oil companies must do business as a result of present economic conditions, it is further necessary to seek and install improved and more efficient methods of production and operation. As a result of the great improvement in refinery operations brought about by the foregoing incentives, many serious hazards have been introduced."

The possibilities of contracting silicosis in sandblasting operations, the toxic qualities of chlorinated hydrocarbons and the dangerous properties of tetraethyl lead were covered in Mr. Bonsib's address.

"In the development of new processes and installations it is essential provisions be made right from the start for safeguarding all employes necessary to carry out the improvements. Unless this is done," he said, "the savings accomplished by the improvements may be entirely dissipated in disability compensation claims, medical costs and expensive damage suits."

Mr. Fick in his talk on "Safeguarding Hazards of Electricity in Refineries" reviewed the recommendations by the U. S. Bureau of Mines and electrical testing laboratories in the operation of electrical equipment in the presence of explosive or highly flammable gases. He gave a brief resume of tests to minimize hazards of fires caused by lightning either through induced or direct strokes, pointing out that all-metal tanks afford the best protection against both.

Mr. Forbes offered the safety organization plan sponsored by the U. S. Bureau of Mines and the plan was adopted by

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## Ratio of Gasoline to Oil Consumption

The American Petroleum Institute presents, in the following table, the results of a survey recently undertaken, to determine the ratio of gasoline to oil consumption in motor vehicles during the past year.

In the majority of cases, contributors to this survey were unable to segregate the consumption of transmission and differential oils from oil used in crankcases. It was, therefore, deemed advisable to include the transmission and differential

**RESULTS OF SURVEY**

| Classification— | Number of vehicles covered by reports | Per cent of average number of vehicles in use 1934 | Total gasoline consumed 1934 (gallons) | Oil consumed in crankcase, transmission and differential 1934 (gallons) | Ratio— Gasoline to oil (gallons) | Ratio— Oil to gasoline (gallons) | Per cent oil to gasoline |
|---|---|---|---|---|---|---|---|
| Passenger cars | 8,657 | .04% | 12,861,641 | 431,827 | 29.78-1 | .0336-1 | 3.36% |
| Trucks | 11,184 | .35% | 23,203,809 | 645,494 | 35.95-1 | .0278-1 | 2.78% |
| Cars and trucks* | 4,270 | ..... | 6,855,986 | 164,095 | 41.78-1 | .0239-1 | 2.39% |
| Busses | 2,175 | 2.18% | 19,637,774 | 340,370 | 57.70-1 | .0173-1 | 1.73% |

*Of the vehicles reported under this classification, 50 per cent or more were trucks.

Questionnaires were mailed to, and received from operators of fleets of motor vehicles in every section of the country. This survey may be said, therefore, to reflect geographically average conditions as well as an average ratio of oil consumed to gasoline consumed. However, it cannot be said to reflect the "average per vehicle consumption." This average, according to estimates, is about 665 gallons of gasoline per year, while the average per vehicle reported to this survey is 2,002 gallons, indicating that the vehicles, covered by this survey, were in more constant use during the year than the general average.

oils with crankcase oil in calculating this ratio. However, reports received from operators who did indicate the consumption of transmission and differential oils separately showed a total consumption of 5,772,180 gallons of gasoline, and a ratio of 1 gallon of oil used in transmission and differential to every 505 gallons of gasoline consumed.

Information on the consumption of chassis greases was reported by operators having a total consumption of 15,992,145 gallons of gasoline. They indicated the consumption of grease in the ratio of 1.56 pounds per 100 gallons of gasoline consumed.

## J. H. Herbert to Head White Star Publicity

The appointment of James H. Herbert as director of industrial relations for the White Star Division of Socony-Vacuum Oil Co., Inc., with offices in Detroit,

JAMES H. HERBERT

Mich., was announced this week by General Manager Howard A. Coffin. Mr. Herbert came to Detroit from Cleveland, where he was assistant manager of the industrial relations department for the Standard Oil Co. of Ohio.

### NEW MICHIGAN REFINERY

MUSKEGON, Mich, June 7.—A new 750 to 1,000-bbl. independent plant will be erected in Ithaca, Mich., about 15 miles east and 2 miles north of the new Crystal Township, Montcalm County, oil field in central Michigan.

The plant will be built and operated by the Ithaca Refining Co., now in the process of organization with a capital of $80,000. John F. McKinney and J. O. Beet, of Ithaca, are backing the project, under which they plan to be ready for operations about September 1.

An adequate supply of crude has been assured through negotiations last week with C. L. Maguire, head of the Roosevelt Oil Co. and Simrall Pipe Line Co. of Mount Pleasant.

### ALCOHOL BLENDER

A person who blends alcohol with gasoline is a producer of gasoline within the meaning of Section 617 of the Revenue Act of 1932, as amended, and Article 30 of Regulations 44 (1934), and is required to register and give bond as provided in Articles 8 and 9 of Regulations 44 (1934). As a producer of gasoline, he is liable for the tax on the sale or use of the product, regardless of whether the gasoline content is purchased tax-free or tax-paid from the producer thereof. Where the gasoline content is purchased tax-paid, the tax paid by the prior producer or producers of the gasoline may be credited against the tax due on the sale or use of the blended product, provided the evidence outlined in Article 84 of Regulations 44 (1934) is submitted.

### COMPLETE TERMINAL

NEW YORK, June 8.—The Royal Petroleum Terminal Corp. has completed a deep water terminal at Sewaren, N. J., serving the New York harbor area. Frank S. Sylvestre is president of the company.

# Camp Hill Structure Appears More Favorable; East Texas Extended East and Northwest

By L. E. BREDBERG

DALLAS, Tex., June 10.—The Camp Hill structure 7 miles southeast of Palestine in Anderson County, on which Gulf Production Co. has three oil producers and two dry holes, is appearing more favorable with the testing of two wells nearing completion. No. 1 Southern Pine Lumber Co., in the H. Main Survey, a north offset to the discovery, which is producing from the sub-Clarksville, made a drill stem test from 5,080 to 5,106 feet and showed 3,000 feet of oil in 15 minutes through three-eighths inch choke on top and bottom of tubing. This will be the first northern extension.

No. 1 Delaney, in the P. Martin Survey, due south of the company's No. 1 Maddox producer, is also showing for a producer. Drill stem test was made from 5,130-81 feet. It showed 100 feet of oil and 300 feet of mud through three-eighths inch choke on top and bottom of tubing, on an 11-minute test. Top of the Woodbine sand was reported at 5,177 feet, and if this is correct it appears this test will make a producer from the Woodbine instead of the sub-Clarksville although the test was 49 feet higher on base of the Austin chalk than the Maddox producer to the north and that test is producing from the sub-Clarksville. When these tests are completed other locations are expected to be staked. The field is defined west and south, but no dry holes have been drilled northwest, east or southeast. Humble Oil & Refining Co. previously drilled a "duster" to the north in the northeast quarter of the H. Main Survey, abandoning it at 5,080 feet.

### Anderson County Dry Hole

Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 1 C. T. Valentine, 7 miles north of Palestine, in the John Little Survey, Anderson County, appears a dry hole after showing 400 feet of mud and 1,480 feet of salt water in 10 minutes, with no oil or gas, when tested at 5,215-82 feet through three-eighths inch chokes at top and bottom of tubing. It is running Schlumberger survey to check density and porosity of the formations drilled.

### Rusk Area—Cherokee County

Scott and Turpin and others' No. 1 Whiteman and Decker, in the J. H. Armstrong Survey, southeast of the Rusk producers, Cherokee County, topped the Pecan Gap chalk at 4,267 feet and is drilling at 4,280 feet. Elevation is 545 feet. If a producer, it will extend the Rusk Pool nearly 3 miles and will no doubt create a second boom. Due to the recent completion of a second well southeast of the discovery, three locations have been staked by the operators making the discovery, and others are again becoming interested. The three tests, one now drilling, are all north of the discovery.

Shell Petroleum Corp. has staked locations for two tests in the Rusk Pool, a south offset to Wood and Young's No. 4 and an east offset to the second producer, No. 4. Both tests will be in the Levi Jordan Survey. The discovery well was drilled on acreage farmed out by Shell Petroleum Corp. Another test is to be drilled by Roberts Brothers and others on the H. E. Pryor farm in the Jessie T. Jones Survey, north of the producers.

These three tests will make four drilling in the area with two more locations to be drilled immediately following completion of Wood and Young's No. 5 New Birmingham Development Co., now drilling 600 feet due north of the second producer, No. 4 or 3-A.

### Wildcat Failures

Morrow and others abandoned No. 1 Watkins, in the Z. Bailey Survey, 3 miles south of Caro in Nacogdoches County, at a total depth of 4,170 feet. W. L. Cloud and others abandoned No. 1 D. Kendall, in the J. Williams Survey, 1½ miles southeast of Jamestown, in Smith County, at a total depth of 1,650 feet.

### Wildcat Tests

Two tests are to be drilled on a block of 17,000 or 18,000 acres around the town of Emory in Rains County. Allen, McClung and others have made location 1,430 feet from the west and 200 feet from the north lines of a 75-acre tract in the N. Brantley Survey, 2 miles southwest of Emory. No. 1 Giles location, on which rig is going up, is 330 feet from the west and 200 feet from the north lines of a 105-acre tract in the Pete Cunningham Survey, and 4½ miles due south of No. 1 Bullard. Ford Bradish and Roy Reynolds, consulting geologists of Fort Worth, checked the geology. Both structure and faulting condition is supposed to maintain in the area. The two tests are to go to 4,300 feet and W. H. (Bill) Harrison, drilling contractor of Tyler, has the contracts.

Roeser and Pendleton, Inc., of Fort Worth, is taking a block northwest of Montalba in Cherokee County, east and a little southeast of Blackfoot. It lays in the J. P. Reinhart, Paul S. Critchfield, J. Welch, W. Chairs and J. Chairs Surveys.

St. Germain Oil Co. has made tentative location in the southeast corner of the G. S. Long 160-acre tract in the Thomas Quevedo Survey, about 1 mile south of Mount Selman, Cherokee County, for a Woodbine sand test.

Frank M. Head has taken a 4,000-acre block between the towns of Celeste and Leonard in Hunt County, centering around the R. H. Black Survey, and is to start a Woodbine sand test in 90 days from May 15.

A block is being taken about 2 miles south of the town of Nacogdoches, and is to assemble 3,500 acres for a test to be commenced as soon as block is assembled.

Charles Kaylor of McCullar is assembling a 10,000-acre block west of Franklin in Robertson County for a test. The south line of the block is the railroad tract.

Dean and Adkisson's No. 1 L. Finklea, in the Benjamin Anderson Survey, western Wood County, was abandoned this week at a total depth of 2,510 feet. Elevation is 393 feet. It was reported 120 feet lower on structure than Rio Oil Corp.'s No. 1 Easter dry hole in eastern Rains County, abandoned last year at total depth of 4,353 feet. The operators drilling No. 1 Finklea considered it useless to drill deeper.

An interesting test under way north of the Cayuga extension area, northwest Anderson County, is being drilled by C. D. Neff and others on the H. G. Small tract in the I. Greeson Survey. It is about 3 miles north of the Wortham extension well, and over in Henderson County. The extension area is one of the most active drilling spots in the entire district. One well, Roeser-Pendleton, Inc.'s No. 2 Wathen, was completed this week flowing 6½ bbls. per hour through one-quarter inch choke, producing from only 1 foot of sand and total depth 4,058 feet.

### EAST TEXAS FIELD

As a result of continued extension, especially on the east and north and northeast sides, the East Texas Field is estimated as having at least 125,000 proven acres and is still being extended. Bert Fields and others' No. 1 E. L. Walker, in the J. M. Tallent Survey, Upshur County, about one-half mile west of production, extended the northwest end. This test logged the sand at 3,662-65 feet and showed a hole full of oil on drill stem test. It is due to make a flowing well from the 3 feet of sand taken, this small amount of sand being all that is necessary in producing a well that can make the daily allowable set by the Railroad Commission.

There are now nearly 18,000 wells in the field with no cessation in drilling in sight. There were 96 locations staked this week with 82 producers completed. One test was junked and abandoned and one test missed the sand and was plugged. Five were completed as pumpers and one was put on air lift.

The Railroad Commission's men are ferreting out the "dead" wells and making operators and companies put them on the pump to produce their marginal well allowable instead of taking their production from flowing wells on the same lease, and more pumping equipment is being ordered as a result.

C. & G. Oil Co., headed by E. B. Germany of Dallas, has sold a half interest in its East Texas properties to the Alger Oil Co. of Gladewater and Shreveport. The interest was formerly held by Mrs. Tom E. Cranfill, widow of the founder of the Cranfill companies, and Mrs. E. B. Germany. The leases totaled 173 acres in nine tracts.

### COMPLETIONS—EAST TEXAS DISTRICT

#### Anderson County

Roeser & Pendleton's No. 2 Wathen, top sand 4,056 feet, total depth 4,058 feet, initial production 6½ bbls. per hour, one-quarter inch choke, base oil sand 4,057 feet, had only 1 foot oil sand. Tide Water-Seaboard's No. 9 Ware, top sand 4,078 feet, total depth 4,097 feet, sand, initial production 117.51 bbls. first 24 hours, tubing pressure 500 pounds, casing pressure 600 pounds.

#### Nacogdoches County

Morrow and others' No. 1 Watkins, completed May 30, 1935, total depth 4,170 feet, dry and abandoned.

#### Smith County

W. L. Cloud's No. 1 Kendall, completed June 1, 1935, total depth 1,650 feet, dry and abandoned.

#### Gregg County

Amerada Petroleum's No. 14 Bumpus, top sand 3,552 feet, total depth 3,580 feet, initial production 20 bbls. in 20 minutes; No. 15 Cont. State Bank, top sand 3,562 feet, total depth 3,592 feet, initial production 21 bbls. in 20 minutes. Arkansas Fuel's No. A-14 Lathrop, top sand 3,578 feet, total depth 3,603 feet, initial production 35 bbls. in 15 minutes.

## East Central Texas Wildcats

Week Ending June 8

**CAMP HILL AREA—ANDERSON COUNTY**

Gulf Prod. Co.'s No. 1 DeLaney, 200 ft. out of most northerly NW cor. of 172.5-ac. tract; elevation 573 ft.; P. Martin Sur. B.P.G. 4,135 ft.; A.C. 4,855-5,055 ft.; cored 5,072-76 ft.; rec. 2-in. poker chip sh. 12 min. D.S. test 5,030-72 ft. rec. 60 ft. mud; top sand 5,058 ft.; coring 5,130 ft.; shale.

Gulf Prod. Co.'s No. 1 Southern Pine Lumber Co., 330 ft. out of SE cor., H. Main Sur.
B.P.G. 4,234 ft.; A.C. 4,868-5,095 ft.; T.D. 5,106 ft.; 15-min. D.S. test 5,080-5,106 ft. tested 3,000 ft. of oil; ⅜-in. choke top and bottom; setting csg.

Hunt and Sun Oil Co.'s No. 2 Alice Scott, 20 ft. N of No. 1, James Crawford Sur. Swbd. fresh wtr. and scum oil; T.D. 1,153 ft.; R.U. tubing to blow with air.

J. W. Luttes' No. 1 C. McKee, 2,640 ft. from N line of lease and survey and 330 ft. from W line of McKey 200-ac. tract.
Elev. 391 ft.; drlg. shale 3,215 ft.

**CAYUGA AREA—ANDERSON COUNTY**

Tide Water Oil Co. et al's No. 21-A Wells, 4,079 ft. N and 2,333 ft. W of lease, S. Edmondson Sur. (Trinity test).
3,253 ft.; no report.

**LONG LAKE AREA—ANDERSON COUNTY**

Tide Water Oil Co. et al's No. 1 Shaw and Kern, 1,400 ft. from S and 2,333 ft. from E line, in D. Parker Sur.
Began June 3; 12½-in. 270 ft.; W.O.C.

**BOWIE COUNTY**

Tex-Ark. Oil Co.'s No. 1 Hamilton Estate, 600 ft. E and 350 ft. N lines, J. Milan Sur., 4 miles S of Red River.
Sidetracking; T.D. 1,098 ft.

**CHEROKEE COUNTY**

H. A. Baker et al's No. 1 T. Smith, 630 ft. S and 660 ft. W of SW cor. of W. A. Newton's 260-ac. tract, 2¼ miles N of Jacksonville, J. Pineda Sur.
10-in. 275 ft.; drlg. 1,500 ft.

Scott & Turpin's No. 1 Whiteman & Decker, 450 ft. N and 150 ft. W, J. H. Armstrong Sur.
Drlg. 2,940 ft.; sticky shale; skidded 20 ft. E old hole; 10-in. 262 ft.

Jacksonville O. & G. Co.'s No. 1 H. D. Henderson, 660 ft. from N and W lines of 40-ac. tract out of Tankersley 104-ac. tract, 5 miles NE of Jacksonville, J. Pineda Sur.
S.D. 693 ft.

Wilson Stubbs Oil Co.'s No. 1 Rowborts, 450 ft. from S line, 150 ft. from W line of 100-ac. tract, 2 miles SW of Jacksonville, J. D. Wolfin Sur.
S.D. 1,552 ft.

Wood et al's No. 4 New Birmingham Dev. Co., 750 ft. S and 150 ft. E line, 600 ft. N of No. 3.
Began June 1; 10-in. 212 ft.; drlg. sandy shale 1,100 ft.

**FANNIN COUNTY**

B. F. Allen's No. 1-B Argo, center of 16½-ac. tract in J. G. Swisher Sur., 1 mile S of Ector.
Rigged up.

Keen et al's No. 1 R. L. and W. M. Kelley, 660 ft. from E and 440 ft. W, E. Johnson Sur., 3 miles W of Ladonia.
Derrick blew down.

Wilson et al's No. 1 Hancock, 400 ft. from W and 150 ft. from N lines, Sec. 16, L. M. Baldock Sur., ¼ mile S of Trenton.
S.D. 170 ft.

**FRANKLIN COUNTY**

Ferrell et al's No. 1 G. K. Ayers, C. H. Simms Sur., 900 ft. from N line and 5,300 ft. from W line of survey, 6 mi. NE of Winnsboro on 50-ac. tract.
Moving in material.

**FREESTONE COUNTY**

Hoover et al's No. 1 McFall, 150 ft. S and W lines, S. Garrison Sur., E of Mexia.
Location.

J. E. Milburn's No. 1 S. E. McShan, 4,000 ft. NW and 5,000 ft. NE of tract, 3 miles SE of Donie, G. Dias Sur.
S.D. 270 ft.

**GREGG COUNTY**

O. T. Clark's No. 1 Williams, 2,100 ft. from S and 2,400 ft. from W of D. Hill Sur., 3 miles NE of Longview.
S.D. 3,771 ft.

**HENDERSON COUNTY**

Great State's No. 1 Ansley, 1,724 ft. W and 300 ft. S of SE cor. of M. Matthews Sur., N. H. T. Thompson Sur.
S.D. 3,315 ft.

C. D. Neff et al's No. 1 H. G. Small, 450 ft. from W and 375 ft. from E lines, I. Greeson Sur., SW of Crossroads.
Derrick.

H. M. Wilson's No. 1 fee, 970 varas S of NE cor. of 943-ac. tract, 5 miles N of Malakoff.
Derrick.

**HOPKINS COUNTY**

D. A. Hale et al's No. 1 L. M. Hall, 200

(Continued on Page 110)

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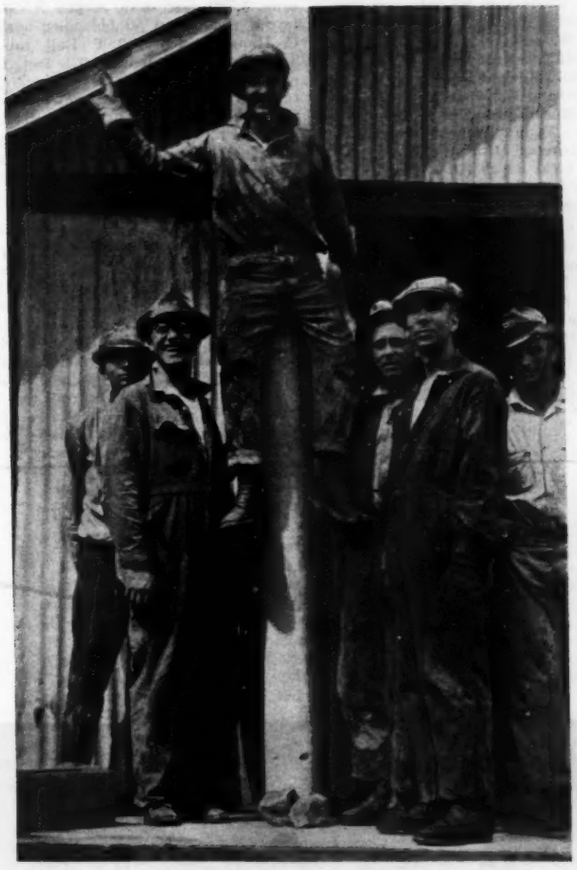

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Atlantic's No. B-30 Burnside, top sand 3,471 feet, total depth 3,520 feet, initial production 136 bbls. per hour; No. B-31 Burnside, top sand 3,473 feet, total depth 3,522 feet, initial production 135 bbls. per hour. Faith Oil Corp.'s No. 19 J. C. Barrett, top sand 3,668 feet, total depth 3,685 feet, initial production 20 bbls. in 18 minutes. G. L. Gillespie, receiver's No. B-4 K. C. Moser (formerly Blackstone), top sand 3,570 feet, total depth 3,621 feet, initial production 100 bbls. per hour.

Humble Oil & Refining Co.'s No. 9 Clemens, top sand 3,615 feet, total depth 3,642 feet, initial production 65 bbls. per hour; No. 14 A. L. Hughes, top sand 3,613-25 feet, total depth 3,641 feet, shale, initial production 60 bbls. per hour. Idaho Oil Co.'s No. 2 T. B. Harris, top sand 3,482 feet, total depth 3,492 feet, initial production 30 bbls. in 15 minutes. J. Long's No. A-8 W. W. Owens, top sand 3,617 feet, total depth 3,637 feet, initial production 46 bbls. per hour. Magnolia Petroleum Co.'s No. A-6 T. W. Tuttle, top sand 3,580 feet, total depth 3,615 feet, initial production 86 bbls. per hour. Marine Production Co.'s No. 7 W. H. York, top sand 3,530 feet, total depth 3,540 feet, initial production 31 bbls. in 30 minutes. Morgan-McMinn's No. 3 Foster, top sand 3,557 feet, total depth 3,608 feet, initial production 33 bbls. in 20 minutes. W. L. Pickens and others' No. 1 Castleberry (Christian), top sand 3,653 feet, total depth 3,683 feet, initial production 80 bbls. per hour, 2-inch tubing.

Nathan Oil Co.'s No. 2 L. Rodden, top sand 3,585 feet, total depth 3,599 feet, initial production 60 bbls. per hour. Shell Petroleum's No. 13 J. W. Aiken, top sand 3,579-3,630 feet, total depth 3,642 feet, shale, initial production 60 bbls. per hour; No. 21 King, top sand 3,529 feet, total depth 3,603 feet, initial production 45 bbls. in 30 minutes. A. H. Tarver's No. 2 Magrill, top sand 3,653 feet, total depth 3,700 feet, initial production 60 bbls. in 30 minutes. Tide Water's No. 35 Lake Davernia, top sand 3,518 feet, total depth 3,560 feet, initial production 75 bbls. per hour. United E. & W.'s No. 1 Clark, top sand 3,605 feet, total depth 3,620 feet, initial production 60 bbls. per hour. Yount Lee's No. B-7 Lathrop, top sand 3,537 feet, total depth 3,557 feet, initial production 60 bbls. per hour, eleven-sixteenths inch choke; No. 9 L. E. Orms, top sand 3,510 feet, total depth 3,530 feet, initial production 60 bbls. per hour, eleven-sixteenths inch choke.

Atlantic's No. 5 G. Davis, top sand 3,536 feet, total depth 3,567 feet, initial production 110 bbls. per hour. Everetts Drilling Co.'s No. 2 P. E. Barton, top sand 3,535 feet, total depth 3,597 feet, shale, initial production 60 bbls. per hour. H. S. Foreman's No. 4 Rowland, total depth 3,578 feet, hole junked and abandoned May 28, 1935. Gralenor Oil Co.'s No. 3 A. A. King, top sand 3,672 feet, total depth 3,675 feet, initial production 100 bbls. per hour. Gulf Production's No. 89 S. Hilburn, top sand 3,516 feet, total depth 3,544 feet, initial production 75 bbls. per hour; No. 11 T. C. Reeves, top sand 3,529 feet, total depth 3,553 feet, initial production 80 bbls. per hour. H. C. Hensley's No. B-3 T. Bell, top sand 3,675 feet, total depth 3,678 feet, initial production 100 bbls. per hour, 2-inch tubing; No. 2 Register, top sand 3,681 feet, total depth 3,689 feet, initial production 150 bbls. per hour; No. 2 A. Thomas, top sand 3,560 feet, total depth 3,564 feet, initial production 120 bbls. per hour.

T. L. James' No. 8 L. Lacy, top sand 3,546 feet, total depth 3,560 feet, initial production 50 bbls. per hour, 2-inch tubing. Jones & O'Brien's No. 1 Lockhart, top sand 3,650 feet, total depth 3,659 feet, initial production 33 bbls. in 16 minutes. Baggett's No. 1 C. L. Still, top sand 3,551 feet, total depth 3,578 feet, sandy shale, initial production pumping 15 bbls. per hour. Sells Petroleum Co.'s No. 4 Williams estate, top sand 3,634 feet, total depth 3,638 feet, initial production 35 bbls. in 30 minutes, 1-inch choke. Stanolind Oil & Gas' No. 3 A. Lockhart, top sand 3,609 feet, total depth 3,618 feet, initial production 80 bbls. per hour. Sun Oil Co.'s No. 20 Hilburn-Lloyd, top sand 3,633-39 feet, total depth 3,649 feet, shale, initial production 35 bbls. per hour. Texas Co.'s No. 29 H. T. Elder, top sand 3,647 feet, total depth 3,675 feet, initial production 80 bbls. per hour. W. C. Turnbow's No. A-2 Culver, top sand 3,576 feet, total depth 3,586 feet, initial production 40 bbls. per hour. Weaver-Crim's No. 9 Peterson, top sand 3,609 feet, total depth 3,628 feet, initial production 80 bbls. per hour.

### Rusk County

Bay Oil Co. and others' No. 13 W. P. Moore, top sand 3,730 feet, total depth 3,737 feet, initial production 67 bbls. per hour. Cordova Union's No. 6 C. O. Christian, top sand 3,648-50 feet, total depth 3,669 feet, shale, initial production 25 bbls. per hour. Gulf Production Co.'s No. 12 Christian, top sand 3,728 feet, total depth 3,750 feet, initial production 43 bbls. per hour, three-quarters inch choke; No. A-18 C. E. Christian, top sand 3,578 feet, total depth 3,594 feet, initial production 60 bbls. per hour, three-quarters inch choke; No. C-26 Christian, top sand 3,648 feet, total depth 3,656 feet, initial production 56 bbls. per hour, three-quarters inch choke. Humble Oil & Refining Co.'s No. 35 J. N. Peterson, top sand 3,617 feet, total depth 3,640 feet, initial production 90 bbls. per hour. Island Oil Co.'s No. 2 Barton, top sand 3,700 feet, total depth 3,740 feet, initial production 93 bbls. per hour. Jones & Mallory's No. 1 J. Gipson, top sand 3,770-71 feet, total depth 3,771 feet, initial production 10 bbls. in 20 minutes. Kirby Petroleum Co.'s No. 12 Reddic, top sand 3,629 feet, total depth 3,730 feet, initial production 45 bbls. per hour.

Magnolia Petroleum's No. 13 Nat Bean, top broken sand 3,489 feet, total depth 3,581 feet, initial production pumping 20 bbls. in five hours. M. Rogers' No. B-5 Sexton heirs, top sand 3,615-53 feet, broken sand, total depth 3,671 feet, shale, initial production 20 bbls. per hour by heads. Royall Petroleum Co.'s No. 1 Taylor, top sand 3,580 feet, total depth 3,672 feet, initial production 40 bbls. in 30 minutes. Amerada Petroleum Corp.'s No. 22 Stovall, top sand 3,598 feet, total depth 3,629 feet, initial production 12 bbls. in 15 minutes. Atlantic's No. 37 Kinney, top sand 3,564 feet, total depth 3,644 feet, shale, initial production 80 bbls. per hour. W. E. Brown and others' No. 1 R. T. McCord, top broken sand 3,531 feet, total depth 3,642 feet, shale, dry and abandoned. Gulf Production Co.'s No. 13 T. B. Cashen, top sand 3,809 feet, total depth 3,813 feet, initial production 5 bbls. per hour, one-quarter inch choke.

Humble Oil & Refining's No. 41 A. D. Blackwell, top sand 3,642 feet, total depth 3,662 feet, initial production 54 bbls. per hour; No. A-9 J. D. Florey, top sand 3,730 feet, total depth 3,772 feet, initial production 70 bbls. per hour; No. 44 Price, top sand 3,712-35 feet, total depth 3,790 feet, shale, initial production 61 bbls. per hour; No. 46 W. L. Price, top sand 3,697-3,730 feet, total depth 3,781 feet, shale, initial production 89 bbls. per hour; No. 11 G. W. Wilson, top sand 3,554 feet, total depth 3,657 feet, initial production 10 bbls. per hour, air lift; No. 24 I. W. Wooley, top sand 3,639 feet, total depth 3,666 feet, initial production 75 bbls. per hour. Hunt Production Co.'s No. C-14 C. Ashby, top sand 3,544 feet, total depth 3,645 feet, shale, initial production pumping 20 bbls. per hour. Alex McCutchin's No. 2 Frederick, top sand 3,589 feet, total depth 3,640 feet, initial production pumping 20 bbls. per hour. Marathon Oil Co.'s No. 72 Cross, top sand 3,623 feet, total depth 3,630 feet, initial production 94 bbls. per hour.

Octo Oil Co.'s No. A-6 Tipps, top sand 3,543 feet, total depth 3,580 feet, shale, initial production pumping 7 bbls. per hour. Overton Refining Co.'s No. 3 Jones, top sand 3,760 feet, total depth 3,764 feet, initial production 70 bbls. per hour. Overtex Oil Co.'s No. 2 Rettig, top sand 3,640


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feet, total depth 3,646 feet, initial production 17 bbls. in 30 minutes. Shell Petroleum Corp.'s No. A-14 H. Brooks, top sand 3,652 feet, total depth 3,713 feet, shale, initial production 25 bbls. in 30 minutes; No. B-17 Brooks, top sand 3,637 feet, total depth 3,707 feet, shale, initial production 50 bbls. per hour. E. L. Smith's No. 3 Wooley, top sand 3,555-61 feet, total depth 3,626 feet, shale, initial production 30 bbls. per hour. Texas Co.'s No. 3 Stubblefield, top sand 3,658 feet, total depth 3,661 feet, initial production 50 bbls. per hour. Texokana Oil Co.'s No. 1 H. Kersh, top sand 3,620 feet, total depth 3,622 feet, initial production 35 bbls. in 15 minutes. Dearing & Son's (formerly T. H. Thompson) No. 2 E. B. Alford, top sand 3,650 feet, total depth 3,700 feet, initial production 20 bbls. per hour.

**Smith County**

Colony Oil Co.'s No. 4 T. O. Wright, top sand 3,680 feet, total depth 3,690 feet, initial production 65 bbls. in 30 minutes. Illinois Oil Co.'s No. 25 Mayfield, top sand 3,834 feet, total depth 3,836 feet, initial production 130 bbls. in two hours; No. 36 Mayfield Co., top sand 3,825 feet, total depth 3,826 feet, initial production 60 bbls. per hour. Stanley Lewis' No. 6 S. S. Cook, top sand 3,752 feet, total depth 3,756 feet, initial production 150 bbls. per hour. R. E. Massingale's No. 1 L. Jackson, top sand 3,826 feet, total depth 3,827 feet, initial production 60 bbls. per hour. Saco Oil Co.'s No. 3 F. Cole, top sand 3,767 feet, total depth 3,769 feet, initial production 40 bbls. in 30 minutes. Sells Petroleum Co.'s No. 2 Mrs. J. B. Wilson, top sand 3,779 feet, total depth 3,781 feet, initial production 70 bbls. per hour. Tex-Canadian's No. C-1 J. R. Iron, top sand 3,755 feet, total depth 3,757 feet, initial production 20 bbls. in 20 minutes. Wheelis Oil Corp.'s No. 10 Jarvis-Smith, top sand 3,690 feet, total depth 3,697 feet, initial production 70 bbls. per hour.

**Upshur County**

John Coates' No. A-3 F. Williams, top sand 3,610 feet, total depth 3,616 feet, initial production 80 bbls. per hour. Leo Hart, receiver's No. 1 W. Starr, top sand 3,592 feet, total depth 3,601 feet, initial production 40 bbls. per hour. Humble Oil & Refining's No. 29 J. K. Edwards, top sand 3,577 feet, total depth 3,605 feet, initial production 51 bbls. per hour; No. 31 I. D. Smith, top sand 3,650 feet, total depth 3,660 feet, initial production 75 bbls. per hour. Magnolia Petroleum Co.'s No. 10 B. Doby, top sand 3,736 feet, total depth 3,760 feet, initial production 60 bbls. per hour. Southland Drilling Co.'s No. 1 Shelton, top sand 3,735 feet, total depth 3,741 feet, initial production 60 bbls. per hour. Sun Oil Co.'s No. 9 T. C. Ramey, top sand 3,788 feet, total depth 3,791 feet, initial production 50 bbls. per hour. Vera Oil Co.'s No. 4 Owens, top sand 3,817 feet, Second sand 3,838 feet, total depth 3,839 feet, initial production 20 bbls. per hour.

## West Texas Fields

(Continued from Page 101)

Effective July 15 Atlantic Pipe Line Co. will disconnect from all leases in Coleman County. It is now connected to 20 leases, containing 61 wells making 300 bbls. per day in the Stewartson, Santa Anna, Overall and Eppenauer Pool in the southern part of the county. Sinclair Prairie Pipe Line Co. may extend its lines to take over the connections. The Atlantic company has been storing the oil at its Valeria tank farm and "batching" it to pump out, but feels the production is so small it does not justify running any longer.

Pitzer and West are drilling below 3,225 feet in No. 1 De Lafosse, in the northeast corner of T.E.&L. Survey No. 1,549. It is expected to contact the Breckenridge lime at 3,600 feet, but is projected to go to 4,000 feet. The operators have a block of more than 4,000 acres in this part of Shackelford County, east of Albany. The Ibex Pool is about 5 miles south.

Production in the district averaged 63,390 bbls. per day during the week.

**PANHANDLE DISTRICT**

Eight engineers of the Railroad Commission were to start a field wide test of all gas wells in Carson, Gray, Hutchinson, Moore, Potter and Wheeler Counties in the Panhandle district today. The wells will be shut in for 72 hours prior to the tests which are being made to determine the open flow capacity and rock pressure of each well. It will probably take two months to complete the work, the data to be used in prorating wells and distributing production to the pipe line companies as result of recent state legislation which becomes effective October 1.

Bell Oil & Gas Co.'s No. 1 Furneaux, in Section 110, Block B-2, H.&G.N. Survey, south of the granite ridge in Gray County, is making one-half barrel of oil per hour while fishing at 2,975 feet. It is making 3,800,000 feet of gas from lime at 2,892 feet and the oil is coming from the Dolomite. First oil was logged at 2,915-18 feet with an increase at 2,935-45 feet. It will be given a shot before completed.

**Childress County Wildcat**

Alma Oil Co.'s No. 1 Mollie Lowe, 3 miles south of Kirkland, in southeastern Childress County, has lost most of its attraction during the week with salt water showing up in greater quantities and reports stating it is gaining in temperature. Gas is increasing, however, but the water will have to be plugged off to produce the oil if it is to make a producer. Considerable oil is being swabbed from top of the fluid column. Total depth is 5,653 feet and the saturated section was logged at 5,630 feet.

There were 4 locations staked in the Panhandle district during the week, and 10 completions reported, all producers.

**WICHITA FALLS COMPLETIONS**

**Archer County**

A. & D. Oil Co.'s No. 1 S. M. J. Benson, top pay 815 feet, total depth 823 feet, initial production 20 bbls. of oil and 20 bbls. of water. O. T. Anderson Oil Co.'s No. 11 William Justice, top pay 1,077 feet, total depth 1,092 feet, initial production 25 bbls. per day. L. T. Burns' No. 2 E. Albers, top pay 1,239 feet, total depth 1,251 feet, initial production 55 bbls. per day; No. 1 E. H. and J. E. Morrison, abandoned location. Consolidated Oil Co. and others' No. 1-D Ward Brothers, total depth 1,048 feet, dry and abandoned. F. H. E. Oil Corp.'s No. 4 F. Brazina and others, top pay 1,466 feet, total depth 1,450 feet, initial production 12 bbls. per day; No. 11 W. T. Richardson, top pay 1,431 feet, total depth 1,433 feet, initial production 70 bbls. per day. Magee and Stipe's No. 1 J. T. Richardson, total depth 1,307 feet, dry and abandoned.

Panhandle Refining Co.'s No. 4-F H. O. Prideaux, top pay 688 feet, total depth 693 feet, initial production 2 bbls. per day. Perkins and Cullum's No. 176 Falls, top pay 1,143 feet, total depth 1,163 feet, initial production 350 bbls. per day. Continental Oil Co.'s No. 17-B Falls, top pay 1,102 feet, total depth 1,122 feet, initial production 72 bbls. per day pumping; No. 9-C Falls, top pay 1,127 feet, total depth 1,144 feet, completed as key well; No. 13-D Falls, top pay 1,083 feet, total depth 1,101 feet, initial production 27 bbls. per day pumping. Perkins and Cullum's No. 178 Falls, top pay 1,130 feet, total depth 1,151 feet, initial production 200 bbls. per day. Ray and Staniforth's No. 6-B T. B. Wilson, top pay 1,607 feet, total depth 1,613½ feet, initial production 75 bbls. per day. Texas Co.'s No. 1-E W. H. Taylor, total depth 1,702 feet, dry and abandoned. Frank Wood and others' No. 1 H. F. Harmel, total depth 1,440 feet, dry and abandoned. G. C. Wood and others' No. 1 W. A. Lyles, total depth 798 feet, dry and abandoned.

**Clay County**

I. J. Allen and others' No. 1 Maria Conrady, total depth 1,270 feet, dry and abandoned. R. J. Brown and others' No. 1 Sidney Webb, total depth 1,010 feet, dry and abandoned. Taylor and Davis' No. 2 J. P. Boddy, total depth 375 feet, dry and abandoned.

**Baylor County**

Ray and Staniforth's No. 5-A Portwood, top pay 1,362½ feet, total depth 1,374½ feet, initial production 275 bbls. per day.

**Cooke County**

F. W. Merrick's No. 3 A. Knabe, top pay 762 feet, total depth 781 feet, initial production 140 bbls. per day; No. 2 G. A. Stelzer, top pay 786 feet, total depth 816 feet, initial production 12 bbls. per day. George L. Pace's No. 2 S. P. Aldredge, top pay 1,130 feet, total depth 1,166 feet, initial production 18 bbls. per day; No. 1 J. Paulter, total depth 1,668 feet, dry and abandoned. Seigal and Taxman's No. 1 J. R. Daniels, total depth 1,637 feet, dry and abandoned. Texas Co.'s No. 1 Nat Piott, top pay 691 feet, total depth 712 feet, initial production 50 bbls. per day.

**Jack County**

Brazos River Gas Co.'s No. 4 S. A. York, top pay 2,854 feet, total depth 2,910 feet, initial production 15 bbls. of oil and 3,000,000 feet of gas per day.

**Montague County**

Burk Royalty Co.'s No. 1 J. C. Casey, total depth 2,108 feet, dry and abandoned. Continental Oil Co.'s No. 1-A W. W. Jones, total depth 962 feet (deepened from 803 feet), dry and abandoned.

**Wichita County**

Bonner Co.'s No. 1 Mrs. P. Boyd, total depth 1,814 feet, dry and abandoned. Dudley and Kolp's No. 1 Kemp Estate, total depth 803 feet, dry and abandoned. Texas Co.'s No. 67 W. B. Honaker, top pay 1,056 feet, total depth 1,067 feet, initial production 25 bbls. per day.

**Wilbarger County**

Clark and Cowden's No. 3 Waggoner Estate, total depth 1,996 feet, dry and abandoned. John O'Neal's No. 2-B Waggoner Estate, top pay 533 feet, total depth 541 feet, initial production 10 bbls. per day.

**Young County**

Atchley and Butler's No. 1 C. J. Wright, total depth 1,028 feet, dry and abandoned. F.H.E. Oil Corp. and Fleming and Kimbell's No. 1 C. H. Mothes, total depth 1,300 feet, dry and abandoned. Fresno Oil Co.'s No. 2 J. Kirkland, top pay 668½ feet, total depth 680 feet, initial production 60 bbls. per day. N. D. Goldsmith and others' No. 1-A J. Castleman, total depth 1,322 feet, dry and abandoned. Gorsuch Oil Co.'s No. 15 O. W. Matthews, total depth 783 feet, dry and abandoned. L. G. Hawkins and others' No. 2 J. Kirkland, top pay 679 feet, total depth 691 feet, initial production 80 bbls. per day. Petroleum Producers' No. 2 J. K. Jeffery Estate, total depth 822 feet, dry and abandoned. S. H. Simmons' No. 1 W. H. Daley, total depth 575 feet, dry and abandoned. Solo Oil Co.'s No. 2 O. Deitrich, top pay 1,098 feet, total depth 1,103 feet, initial production 40 bbls. per day. Tebay and Leberman's No. 1 N. L. Hardy, total depth 780 feet, dry and abandoned. Texas Co.'s No. 5-A Jeffery Estate, top pay 738 feet, total depth 746 feet, initial production 45 bbls. per day.

**WEST TEXAS COMPLETIONS**

**Ector County**

Barnsdall Oil Co.'s No. 2 Smith, dry and abandoned at 4,381 feet; elevation 3,064 feet; show oil 4,137 feet. International Petroleum Corp.'s No. 1 Cowden, top pay 4,147 feet, total depth 4,330 feet, shot with 750 quarts from 4,137-4,330 feet, initial production 395 bbls. per day; elevation 3,019 feet.

**Ward County**

Atlantic Oil Producing Co.'s No. 2 Miller, top pay 2,397 feet, total depth 2,583 feet, initial production 656 bbls. in 15 hours, 3 to 12 per cent water. California Co.'s No. 33 Durgin, top pay 2,386 feet, total depth 2,540 feet, initial production 630 bbls. per day; No. 6 Gordon, top pay 2,475 feet, total depth 3,533 feet, shot with 200 quarts from 2,333 to 2,533 feet, initial production 1,299 bbls. per day. Richardson's No. 3 Richter, top pay 2,393 feet, total depth 2,560 feet, initial production 175 bbls. per day. Thompson's No. 6-B Johnson, top pay 2,274 feet, total depth 2,531 feet, shot with 325 quarts from 2,268 to 2,503 feet, initial production 375 bbls. per day. Westbrook and Thompson's No. 7 Bennett, top pay 2,342 feet, total depth 2,564 feet, shot with 265 quarts from 2,342 to 2,562 feet, initial production 875 bbls. per day.

**Pecos County**

Stanolind Oil & Gas Co.'s No. 5-C Tippett, top pay 495 feet, total depth 555 feet, initial production 206 bbls. per day, pumping. Clay and Johnson's No. 1 Smith, top pay 906 feet, total depth 930 feet, initial production 67 bbls., pumping.

**Reagan County**

Byrd-Frost, Inc.'s No. 1 Boyd, dry and abandoned at 3,334 feet, elevation 2,669 feet.

**McCulloch County**

Honea and others' No. 1 Cox, dry and abandoned at 909 feet. Odell, Skaggs and Brewer's No. 1 Dunn, dry and abandoned at 843 feet.

**Upton County**

Baldridge Oil Co.'s No. 1 Peck, dry and abandoned at 4,813 feet,

**PANHANDLE COMPLETIONS**

**Gray County**

Cantone Oil Co.'s No. 4 Morse, top pay 2,470 feet, total depth 2,592 feet, shot 400 quarts from 2,472-2,590 feet, initial production 224 bbls. per day, pumping. Continental Oil Co.'s No. 9 Wright, top pay 2,793 feet, total depth 2,875 feet, initial production 925 bbls. per day, pumping. Forster's No. 1 Johnson, temporarily abandoned. Kewanee Oil & Gas Co.'s No. 9 Smith Rest, top pay 3,120 feet, total depth 3,250 feet, shot 400 quarts from 3,121-3,250 feet, initial production 435 bbls. per day, pumping. Nabob Oil Co.'s No. 3-A Morse, top pay 2,575 feet, total depth 2,780 feet, shot 60 quarts from 2,695-2,740 feet, initial production 5 bbls. day. Southern Petroleum Exploration Co.'s No. 6 McConnell, top pay 3,240 feet, total depth 3,285 feet, shot 100 quarts from 3,235 to 3,275 feet, initial production 108 bbls. per day, pumping. Sun Oil Co.'s No. 9 Combs-Worley, top pay 3,025 feet, total depth 3,077 feet, initial production 779 bbls. per day, pumping.

**Hutchinson County**

S & M Oil Co.'s No. 2 Moore-Langdon, top pay 3,037 feet, total depth 3,110 feet, plugged back to 3,100 feet, shot 640 quarts from 2,965-3,100 feet, initial production 366 bbls. per day, pumping. Texas Co.'s No. 7-A Garner, top pay 3,020 feet, total depth 3,048 feet, shot 140 quarts from 2,981-3,048 feet, initial production 111 bbls. day, pumping.

**Moore County**

Magnolia Petroleum Co.'s No. 3 Jones, top pay 3,402 feet, total depth 3,404 feet, initial production 26 bbls. oil and 5 bbls. water in five hours.

**Wheeler County**

Smith Brothers and others' No. 1-B Sitter, old well deepened from 2,140 to 2,584 feet, oil pay 2,480 feet, shot 60 quarts from 2,455-2,546 feet, initial production 20 bbls. oil and 6,800,000 feet gas.

**COMPLETIONS IN WEST CENTRAL (RANGER) DISTRICT**

**Shackelford County**

Albany Oil Co. and others' No. 1 Davis, total depth 1,591 feet, initial production 40 bbls. a day. Engle and others' No. 1 Matthew, dry and abandoned 1,060 feet. Fain & McGaha's No. 1 Rife, dry and abandoned 1,704 feet. Farris and others' No. 1 Baker, total depth 1,643 feet, initial production 45 bbls. a day. F.H.E. Oil Co.'s No. 1 Blank, dry and abandoned 1,840 feet. Morlang and others'

No. 1 Davis, total depth 1,640 feet, initial production 65 bbls. per day.

Peckman and others' No. 1 Matthews, dry and abandoned 1,080 feet. Reliance Oil & Royalty Co.'s No. 4 Davis, total depth 1,625 feet, initial production 25 bbls. per day. Roeser & Pendleton and Continental Oil Co.'s No. 1-61-C Cooke, dry and abandoned 1,342 feet. Tannehill Oil Co.'s No. 1 Blank, dry and abandoned 2,265 feet. Wolker's No. 1 Blank, dry and abandoned 885 feet. Wenona Oil Co.'s No. 5 McCassland, dry and abandoned 805 feet.

**Throckmorton County**

Falls Production Co.'s No. 9 Graham, total depth 3,169 feet, initial production 35 bbls. daily. Humble Oil & Refining Co.'s No. 3-A Davis, dry and abandoned 615 feet.

**Brown County**

Gross' No. 1 Kellar, dry and abandoned at 1,146 feet. Sher-Ritt Oil Co.'s No. 1 Williams, total depth 1,216 feet, plugged back to 1,109 feet, initial production 250,000 feet gas.

**Callahan County**

Ungren & Frazer's No. 7-C Jackson, dry and abandoned 1,222 feet.

**Palo Pinto County**

Conway and others' No. 3 Carter, dry and abandoned 2,420 feet.

**Mills County**

Threckel Brothers' No. 1 Weston, dry and abandoned 1,730 feet.

## Market Nervousness Is Disappearing in Chicago

(Continued from Page 97)

limited. Industrial gas oil is holding up moderately well, with prices showing little change.

**Wax**

Waxes are unchanged, but that is the best thing that may be said of them. Tone is easy, with stocks remaining quite large.

**Naphthas**

There is no change in trend in solvents and naphthas, undertone being firm to strong in sympathy with gasoline. Buying is moderate.

**Coke**

Low temperatures for the season have improved demand a little for coke, and sellers are able to get slightly higher prices for lower grades.

## N.P.A. Fire and Safety Marshals Hold Meeting

(Continued from Page 103)

the Fire and Safety Marshals of the National Petroleum Association.

S. M. Wolbert, Kendall Refining Co., Bradford, was elected president to succeed J. H. Herbert who was appointed chairman of the executive committee. D. J. Harvey, Pennzoil Co., Oil City, was chosen vice president, and Charles Lindberg, Conewango Refining Co., Warren, secretary-treasurer.

Speakers at the luncheon included C. L. Suhr, president, National Petroleum Association; J. G. Payne, mayor of Oil City; O. P. Keeney, Wolverine-Empire Refining Co., Reno; Huston Dunn, secretary, National Petroleum Mutual Fire Insurance Co.; Willis Crane, associate counsel, National Petroleum Association, and Mr. Herbert.

Team No. 2 of the Kendall Refining Co., Bradford, won the first aid contest and received the association plaque. Other contestants in the order in which they finished: Kendall Refining Co., team No. 2; Pennzoil Co.; Sinclair Oil Refining Co., Wellsville, N. Y., plant; Standard Oil Co. of Ohio, teams Nos. 1 and 2, Cleveland; Hyvis Oils, Inc., teams Nos. 1 and 2, Warren; Quaker State Oil Refining Corp., Farmer's Valley plant; United Refining Co., Warren; James B. Berry Sons Co., Independent plant; Kendall Refining Co., team No. 3.

A series of round table discussions concluded the meeting, on: (1) Proper Methods of Running Foam Lines to a Tank, led by S. M. Wolbert, Kendall Refining Co.; (2) Proper Method of Running Fire Steam Lines to a Tank, led by W. L. Gettings and Charles H. Lindberg, Conewango Refining Co.; (3) Precautions to Be Taken Against Electrical Hazards in a Refinery, led by D. J. Harvey, Pennzoil Co.; miscellaneous subjects, Willis Crane.

## Propane Torch Used for Fighting Forest Fires

(Continued from Page 31)

cluding a 9¼-pound filling of Calol cutting gas, weighs about 35 pounds.

"Tests were conducted by forest officers on brush-burning jobs in different localities, and the Calol gas torch won on every count over torches using gasoline, kerosene, and butane. It burned hotter and more efficiently at any atmospheric temperature. It was safer; weighed less; required only one filling for a full eight-hour day's work. The burner could be lighted instantly with a match, and the flame would not go out regardless of weather or how violently it was swung about, even when it was turned down to pilot-light size. In these tests the new torch proved its ability to light more fires in a shorter time than other torches; when the great Selway fire came along, it earned its fighting spurs under the most arduous conditions.

"The various units of the propane gas torch are assembled ready for use by the Forest Service. The small cylinders are filled from the large cylinders, and each outfit is boxed in a specially constructed case ready for shipment to the field. When an emergency arises, the department is able to pick up 100 men, fully equip them—including rations for 48 hours—and have them loaded in trucks and on their way to the fire in less than an hour. Standard furnishes supply cylinders in two sizes; one containing 41 pounds of gas, and one containing 91 pounds of gas. The smaller containers make very satisfactory side-packs for horse transportation in rough country; the larger are used in most brush-burning camps or locations where trucks can operate. The back-pack cylinders are refilled on the job in from three to five minutes. A small set of spring scales is used in the field to weigh the gas, and the Forest Service stencils on each cylinder the tare, weight of the gas, and the total permissible weight of the pack."

## West Texas Wildcats

(Continued from Page 101)

ft. from S and W, Sec. 22, Blk. 44, Twp. 1n, T.&P. Sur.
Derrick.

**Landreth Prod. Co.'s No. 1 Blakeney, 440 ft. from N and E, Sec. 28, Blk. 43, Twp. 1n, T.&P. Sur.**
Elev. 3,066 ft.; drlg. 832 ft.

**Landreth Prod. Co.'s No. 1-B O. B. Holt, 660 ft. from N and 1,980 ft. from E lines of Sec. 19, Blk. "A," P.S.L. Sur.**
Drlg. 4,222 ft.; hole filling with oil.

**Landreth Prod. Co.'s No. 1 Cowden Heirs, 440 ft. from S and W, Sec. 18, Blk. 44, Twp. 1n. T.&P. Sur.**
Drlg. 4,267 ft.

**Landreth Prod. Co.'s No. 2 Scharbauer, 2,200 ft. from N and 440 ft. from W, Sec. 13, Blk. A, P.S.L. Sur.**
Elev. 3,142 ft.; fishing 3,410 ft.

**C. L. Peters' No. 1 Connell, 330 ft. from N and E lines of NW of Sec. 12, Blk. B-16, P.S.L. Sur.**
S.D. 2,468 ft.

**Phillips Pet. Co. and Pure's No. 1 C. Cowden, 2,200 ft. from N and 440 ft. from W, Sec. 14, Blk. 44, Twp. 1s, T.&P. Sur.**
Rigged up rotary.

**Phillips Pet. Co. and Pure Oil Co.'s No. 2 C. Cowden, 440 ft. from S and W, Sec. 23, Blk. 44, Twp. 1s, T.&P. Sur.**
Cellar.

**EL PASO COUNTY**

**Tri-State Oil Co.'s No. 1 Kinkel, 190 ft. from N and 550 ft. from E, Sec. 237, A.T.&S.F. Sur.**
S.D. 225 ft.; setting csg.

**FISHER COUNTY**

**George Callihan et al's No. 1 Herring, 2,310 ft. from S and 330 ft. from W lines of Sec. 192, Blk. 1, B.B.B.&C. Sur.**
Elev. 1,804 ft.; T.D. 3,690 ft.; U.R.

**Ruse Petroleum Co.'s No. 1 Reynolds, 550 ft. from S and 430 ft. from E of SW ¼ Sec. 3, Blk. R, W. E. Richardson Sur.**
Elev. 1,832 ft.; drlg. 2,875 ft.

**Tide Water Oil Co. et al's No. 1 W. E. Hittson et al, 1,320 ft. from N and 660 ft. from W, Sec. 177, Blk. 2, H.&T.C. Sur.**
Elev. 1,871 ft.; drlg. 2,131 ft.

**GARZA COUNTY**

**N. L. Richards' No. 1 Sullivan, 330 ft. from N and W, Sec. 3, Blk. 5, K. Aycock Sur.**
Elev. 3,534 ft.; T.D. 2,940 ft.; flowed 40 bbls. in 40 minutes while setting csg.

**GLASSCOCK COUNTY**

**John I. Moore et al's No. 1 J. S. McDowell, 1,980 ft. from N line and 660 ft. from E line of Sec. 22, Blk. 34, Twp. 2s, T.&P. Sur.**
Topped lime 9,471 ft.; show oil and gas 9,484-9,520 ft.; increase oil 9,594-9,600 ft. and 9,633-65 ft.; T.D. 9,946 ft.; opened this week and made one 50-bbl. head into slush pit; to deepen.

**HOWARD COUNTY**

**Clay Bros. & White's No. 1 Read, 330 ft. from S and 1,650 ft. from W, Sec. 46, Blk. 30, Twp. 1n, T.&P. Sur.**
T.P. 2,635 ft.; T.D. 2,782 ft.; preparing to pump.

**Eastland Oil Co.'s No. 1 D. H. Snyder, SW cor. Sec. 28, Blk. 30, Twp. 1s, T.&P. Sur.**
Machine.

**John I. Moore et al's No. 1 Snyder, 330 ft. from S and W, Sec. 28, Blk. 30, Twp. 1s, T.&P. Sur.**
Elev. 2,302 ft.; drlg. 1,575 ft.

**Iron Mountain Oil Co.'s No. 6 Reed, 330 ft. from S and W lines of Sec. 46, Blk. 30, Twp. 1n. T.&P. Sur.**
T.D. 2,974 ft.; preparing to pump.

**Texas Co.'s No. 10 Schaik, W half Sec. 13, Blk. 19, Lavaca Navigation Co. lands.**
Machine.

**Wooten's No. 1 Blank, NW ¼ Sec. 46, Blk. 30, Twp. 1n, T.&P. Sur.**
Location.

**JEFF DAVIS COUNTY**

**C. M. Joiner's No. 1 Jones & Coffield, 770 ft. from N and 1,322 ft. from E. Sec. 8, Blk. 2, H.&T.C. Sur.**
Drlg. 1,280 ft.

**JONES COUNTY**

**Campbell et al's No. 1 Rowell, in E half of W half. Sec. 6, T.&P. Sur.**
Drlg. 1,088 ft.

**Campbell et al's No. 1 Enevill, 1,400 ft. from N and 270 ft. from W, Sec. 2, M.E.&P. Sur., ¼ mile S of Anson.**
Drlg. 2,440 ft.

**Moutray & King's No. 1 R. Prichard, 400 ft. from N and 200 ft. from W, Sub. 1, G. Martinez Sur., 5 miles N of Hawley.**
Drlg. 622 ft.

**Owen et al's No. 1 Johnson & Dunwoody, 3,750 ft. from S and 330 ft. from W. Sec. 6, Blk. 17, T.&P. Sur.**
Spudded and S.D.

**Ungren & Frazier et al's No. 1 Steele, 1,450 ft. from S and 200 ft. from W lines of Sec. 3, Blk. 10, C. Allen Sur.**
T.D. 1,960 ft.; to abandon.

**Ungren & Frazier's No. 1 King Ranch, 200 ft. from N and E of NW half, Blk. 6, M. Bueno Sur.**
Drlg. 1,485 ft.

**KIMBLE COUNTY**

**Wilcox Oil & Gas Co.'s No. 1 J. Patterson, 200 ft. from N and E, Sec. 1, D.&P.R.R. Sur.**
C.O. 108 ft.

**LOVING COUNTY**

**D. C. Evans' No. 1 W. D. Johnson, 2,310 ft. from N and 1,650 ft. from W, Sec. 12, Blk. 57, Twp. 1, T.&P. Sur.**
S.D. 2,170 ft.

**Mason Oil Co.'s No. 1 Kyle, 1,980 ft. from S and E, Sec. 22, Blk. 55, Twp. 1, T.&P. Sur.**
T.D. 2,600 ft.; plugged back 1,300 ft.

**LYNN COUNTY**

**Hart Oil Co.'s No. 1 Edwards, 220 ft. from N and 200 ft. from W of SE Sec. 29, L.&S.V. Sur.**
Elev. 3,112 ft.; T.D. 4,817 ft.; drlg. at 2,930 ft. in new hole.

**MARTIN COUNTY**

**Wright & Scott's No. 1 Flannigan, 330 ft. N and E, Sec. 22, Blk. 37, Twp. 1s, T.&P. Sur.**
S.D. 100 ft. for csg.

**MITCHELL COUNTY**

**Sawtell & Grueber's No. 1 Morrison.**
Drlg. 1,476 ft.

**Texas Co.'s No. 1 Terry, 300 ft. from S and 1,650 ft. from E of W 485 acres, Sec. 62, Blk. 29, W.&N.W. Sur.**
Drlg. 350 ft.

**PECOS COUNTY**

**Adams et al's No. 2 Masterson, 1,630 ft. from SE and 330 ft. from SW, Sec. 104, Blk. 10, H.&G.N. Sur.**
C.O. 640 ft.

**Cardinal Oil Co.'s No. 1 White & Baker, 150 ft. S and E lines of "E" lease, Sec. 40, Blk. 194, G.C.&S.F. Sur.**
Elev. 2,712 ft.; drlg. 1,700 ft.; gauged 15,000,000 ft. gas at 1,585 ft.

**Gulf Prod. Co.'s No. 6 White & Baker, 330 ft. from N and W, Sec. 94, Blk. 194.**
T.D. 527 ft.; straightening hole; elev. 2,847 ft.

**W. Hicks' No. 1 Fromme, 1,980 ft. from NE and 2,310 ft. from SE, Sec. 106, Blk. 10, H.&G.N. Sur.**
Location.

**C. R. Richards' No. 4 Courtney, 920 ft. from N and W, Sec. 78, Blk. OW, 360 ft. S of No. 2.**
Elev. 2,967 ft.; C.O. 220 ft.

**Samwan Oil Co.'s No. 2 Masterson, 330 ft. from W and 990 ft. from S lines of Sec. 104, Blk. 10, H.&G.N. Sur.**
Drlg. 475 ft.

**Trans-Tex. Oil Co.'s No. 1 Caldwell, 330 ft. from E line and 330 ft. from S line of Sec. 27, Blk. 40, Twp. 9, T.&P. Sur.**
T.D. 2,310 ft.; repairing pipe.

**REAGAN COUNTY**

**Dobbs No. 1 Friend, 2,310 ft. from S and 660 ft. from W of Blk. 3, Wm. Allen Sur., 3 or 4 miles S of Big Lake.**
S.D. 2,465 ft.; show oil 2,325-30 ft.; increase 2,325 ft.; acidized with 1,500 gals.; bailing oil before treatment.

**John Emch's No. 1 E. V. Belcher, 467 ft. from N and 1,409 ft. from E, Sec. 4, Blk. 4½, G.C.&S.F. Sur.**
Drlg. 3,712 ft.

**Skelly Oil Co.'s No. 1-D H. S. Grayson, 1,980 ft. from N line and 660 ft. from W line of Sec. 33, Blk. 8, University Land Sur.**
S.D. 9,967 ft.; bridged back to 3,100 ft.; testing.

**REEVES COUNTY**

**Dunigan's No. 1 Davis, 330 ft. from N and W, Sec. 7, Blk. 58, P.S.L. Sur.**
Location.

**Herbert Oil Co.'s No. 1 Williams & Walker, 5,280 ft. from S and 1,320 ft. from E, Sec. 17, Blk. 6, H.&G.N. Sur.**
Testing water shut-off 3,738 ft.

**K. Slack et al's No. 1 Reeves, C NW ¼ Sec. 20, Blk. 56, P.S.L. Sur., 22 mi. N of Toyah.**
T.D. 425 ft.

**Washington Oil Co.'s No. 1 J. M. Radford Grocery Co., 2,640 ft. from S and 340 ft. from E, Sec. 39, Blk. 56, P.S.L. Sur.**
S.D. 10 ft.

**RUNNELS COUNTY**

**Dennis et al's No. 1 Wash, 550 ft. from N and 560 ft. from E of W half, Sec. 122, E.T.R.R. Sur.**
Shut down.

**Melrose Oil Co.'s No. 1 L. P. Woods, 150 ft. from NE lines and 5,475 ft. from W line of survey, Willett Holmes Sur. No. 100.**
S.D. 2,507 ft.

**R. Wells' No. 1 James, 396 ft. from N and 330 ft. from E of James tract in Sec. 16, D. Diaz Sur.**
Fishing 1,440 ft.

**Wolverton's No. 1 Willingham, 200 ft. from river and in C of Wilhelm-Wolfgang Sur. No. 425, 1¼ miles SE of Ballinger.**
Drlg. 672 ft.

**SCHLEICHER COUNTY**

**John M. Cooper et al's No. 1 Bert Page, 1,290 ft. from N line, 1,470 ft. from W line of Sec. 40, Blk. L, G.H.&S.A. Sur.**
Drlg. 6,121 ft.

**W. C. Proctor et al's No. 1 Judkins & Spencer, C SW¼ Sec. 4, Blk. V.2S.**
Drlg. 330 ft.

**SCURRY COUNTY**

**M. L. Goos et al's No. 1 J. E. Murphy, 330 ft. from N and 1,650 ft. from E, Sec. 114, Blk. 97, H.&T.C. Sur.**
Elev. 2,287 ft.; T.D. 385 ft.; U.R.

**Magnolia Pet. Co.'s No. 1 J. W. Moore, 1,650 ft. from N and 990 ft. from E, Sec. 342, Blk. 97, H.&T.C. Sur.**
Elev. 2,616 ft.; drlg. 210 ft.

**McLaughlin's No. 1 Allen, 1,331 ft. from N and 1,338 ft. from E, Sec. 298, Blk. 97.**
Drlg. 2,927 ft.

**STONEWALL COUNTY**

**Barnsdall Oil Co.'s No. 1 S. Young, 350 ft. from N and E, Sec. 26, Austin & Williams Sur. 349.**
Elev. 1,726 ft.; drlg. 128 ft.

**SUTTON COUNTY**

**Paul C. Teas' No. 1 G. S. Allison, 660 ft. from S and W, Sec. 49, Blk. A, G.W.T.&P. Sur.**
Location.

**TAYLOR COUNTY**

**Anderson et al's No. 1 J. C. High, 2,310 ft. from N and 990 ft. from E, Sec. 8, L.&L. Sur.**
Machine.

**Skaggs & Brewer's No. 1 McClure, 330 ft. from N and E S half SW Sec. 8, L.A.L. Sur.**
Drlg. 1,330 ft.

**TOM GREEN COUNTY**

**Jacobs et al's No. 2 DeLong, 150 ft. from N and 450 ft. from E, James Webb Sur. No. 53.**
S.D. 515 ft.

**UPTON COUNTY**

**T.P. Coal & Oil Co.'s No. 1 Cordova Union Land, 2,406 ft. from E and 330 ft. from N, Sec. 33, Blk. 1.**
T.D. 2,235 ft.; P.B. to 2,126 ft.; to shoot.

**Gulf Prod. Co.'s No. 103 McElroy, 1,980 ft. from S and 660 ft. from W, Sec. 197, Blk. F, C.C.S.D.&R.G.N.G. Sur.**
T.D. 12,786 ft.; plugged back to 9,952 ft.

**Humble Oil & Ref. Co.'s No. 1 Pollock, C of NW, Sec. 4, Blk. M.**
Drlg. 6,100 ft.

**Williams & Williams Drlg. Co.'s No. 1 Robbins, 1,600 ft. from S and 1,906 ft. from E. Sec. 4, G.C.&S.F. Sur.**
T.D. 2,080 ft.; testing.

**WARD COUNTY**

**Alexander's No. 1 Richter, 1,650 ft. from NW, 1,170 ft. from NE line of Sec. 37, Blk. 34, H.&T.C. Sur.**
Drlg. 2,322 ft.

**Bradford et al's No. 1 E. R. Allen, 660 ft. from NW line and 551 ft. from NE line. Sec. 11, Blk. 5, H.&T.C. Sur.**
T.D. 1,520 ft.; shut down.

**Caprito's No. 1 Hardage & Wilson, 2,310 ft. from NE and 990 ft. from SE, Sec. 11, Blk. 34, H.&T.C. Sur.**
Machine rigged up.

**Eastland Oil Co.'s No. 1 C. D. Mason, 330 ft. from SW and SE, Sec. 14, Blk. 34.**
Drlg. 678 ft.

**Gulf Prod. Co.'s No. 58 O'Brien, 330 ft. from E and 1,650 ft. from S, Sec. 18, Blk. F.**
Drlg. 1,462 ft.

**Gulf Prod. Co.'s No. 57 O'Brien, 2,310 ft. from S and 330 ft. from E, Sec. 18, Blk. F.**
T.D. 2,679 ft.; S.R.

**Magnolia Pet. Co.'s No. 2 Sealy Estate, 2,310 ft. from S and 330 ft. from W, Sec. 43, Blk. F.**
Drlg. 2,680 ft.

**Sageland Oil Corp.'s No. 2 Pure-Bennett, 1,650 ft. from NW and 2,310 ft. from SW S.D. 220 ft.**

**Jerry Sines' No. 1 Brown, 330 ft. from NW and NE, Sec. 13, Blk. 5, H.&T.C. Sur.**
T.D. 3,148 ft.; P.B. 3,075 ft.; shot; to P.B. again.

**West Texas O. & R. Co.'s No. 1-C University, 330 ft. from N and E, Sec. 6, Blk. 16.**
Drlg. 2,669 ft.

**WINKLER COUNTY**

**Barnsdall Oil Co.'s No. 1 Brown & Altman, 2,310 ft. from S and E, Sec. 6, Blk. B-5.**
Elev. 2,844 ft.; S.D. 2,805 ft.

Emperor Oil Co.'s No. 1 Halley, 1,650 ft. from S and 330 ft. from E, Sec. 12, Blk. B-12.
Elev. 2,764 ft.; drlg. 1,110 ft.
Fox & Butler's No. 1 Brown & Altman, 2,310 ft. from S and 1,650 ft. from E, Sec. 6, Blk. B-5.
Drlg. 1,225 ft.
Green Prod. Co.'s No. 1 J. F. Cross, 330 ft. from N and 2,310 ft. from W, Sec. 4, Blk. B-10, P.S.L. Sur.
Shut down.
Gulf Prod. Co.'s No. 1 Keystone Cattle Co., NE of NW, Sec. 10, Blk. B-3, P.S.L. Sur.
Elev. 2,942 ft.; S.D. 2,307 ft.
Gulf Prod. Co.'s No. 2 Keystone Cattle Co., NW cor. Sec. 17, Blk. B-2.
Elev. 2,951 ft.; drlg. 2,630 ft.
Gulf Prod. Co.'s No. 3 Keystone Cattle Co., 330 ft. from N and W of NE ¼ Sec. 11, Blk. B-2.
Drlg. 550 ft.
Gulf Prod. Co.'s No. 4 Keystone Cattle Co., 330 ft. from N and E, Sec. 20, Blk. B-3.
Drlg. 175 ft.
Gulf Prod. Co.'s No. 5 Keystone Cattle Co., 330 ft. from N and W of SW¼ Sec. 6, Blk. B-2.
Drlg. 620 ft.; elev. 2,952 ft.
Gulf Prod. Co.'s No. 6 Keystone Cattle Co., 330 ft. from N and W of NE¼ Sec. 16, Blk. B-2.
Drlg. 413 ft.
Gulf Prod. Co.'s No. 7 Keystone Cattle Co., 330 ft. from N and W of SW ¼ Sec. 14, Blk. B-2.
Rigged up.
Gulf Prod. Co.'s No. 8 Keystone Cattle Co., 330 ft. from S and W of Sec. 13, Blk. B-2.
Rigged up.
Gulf Prod. Co.'s No. 9 Keystone Cattle Co., 330 ft. from S and W of Sec. 18, Blk. B-2.
Rig.
Harry Adams' No. 2 Scarborough, 990 ft. from N line and 990 ft. from W line, Sec. 2, Blk. 77, P.S.L. Sur.
Location.
Humble Oil & Ref. Co.'s No. 2-A Walton, 660 ft. from S and W, Sec. 48, Blk. 26.
Derrick.
K-D Oil Co.'s No. 1 P. Mitchell, 1,650 ft. from N and 2,310 ft. from E, Sec. 23, Blk. B-10, P.S.L. Sur.
Location.
J. C. Maxwell's No. 1 Brown & Altman, 2,310 ft. from N and 990 ft. from W, Sec. 6, Blk. B-5.
Elev. 2,844 ft.; fishing 2,570 ft.
Mid-Continent Pet. Corp.'s No. 2 Howe, 1,650 ft. from N and 330 ft. from W, Sec. 12, Blk. 26.
T.D. 2,989 ft.; T.P. 2,800 ft.
Richardson's No. 1 Walton, 1,010 ft. from S and 330 ft. from W, Sec. 1, Blk. B-3.
T.D. 2,947 ft.; R.U. rotary.
Skelly Oil Co.'s No. 2 Halley, 1,320 ft. from N and 2,200 ft. from E, Sec. 25, Blk. B-11, P.S.L. Sur.
S.D. 3,090 ft.
Skelly Oil Co.'s No. 3 Halley, 2,200 ft. from N and 440 ft. from W. Sec. 16, Blk. B-11.
Elev. 2,746 ft.; derrick.
Sinclair Oil Co.'s No. 1 Lowett, 330 ft. from N and E. Sec. 36, Blk. 26, P.S.L. Sur.
T.D. 2,638 ft.; reloading hole.
Sun Oil Co.'s No. 1 Halley, 2,200 ft. from N and 440 ft. from E. Sec. 24, Blk. B-12 P.S.L. Sur.
Drlg. 3,155 ft.; hole full oil.
Texas Pacific Coal & Oil Co.'s No. 2 Daugherty, 1,650 ft. from S and 330 ft. from E. Sec. 2, Blk. 26, P.S.L. Survey.
Drlg. 3,000 ft.; made 100 bbls. in 24 hrs.
Weaver et al's No. 1 T. Morton, 330 ft. from S and E of N half, Sec. 11, Blk. B-12.
Elev. 2,767 ft.; drlg. 912 ft.

**YOAKUM COUNTY**

C. J. Davidson et al's No. 1 Bennett, 1,320 ft. from N and E, Sec. 678, John H. Gibson Sur.
S.D. 118 ft.; standard derrick.

## Texas Panhandle Wildcats

**Week Ending June 8**

**CARSON COUNTY**

Danube Oil Co.'s No. 1 Byrum, 308 ft. from N and 409 ft. from E of N½ of NE¼, Sec. 107, Blk. 4, I.&G.N. Sur.
Location.
Johnson et al's No. 1 Eller, 330 ft. from N and E, Sec. 200, Blk. 3, I.&G.N. Sur.
Rigged up rotary.
Phillips Pet. Co.'s No. 2 Cooper, 327 ft from N and 989 ft. from W lines of S½ of SE¼ of Sec. 4, Blk. 9, I.&G.N. Sur.
T.D. 3,075 ft.; shot; C.O.
Robert Watchorn's No. 1 Eller, 330 ft. from S and E lines of W½ and SE¼ of Sec. 9, Blk. 7, H.&G.N. Sur.
T.D. 3,102 ft.; standardizing.
Texoma Nat. Gas Co.'s No. 1 Crutchfield, 1,335 ft. S and 1,328 ft. W, Sec. 37, Blk. 4, H.&G.N. Sur.
Drlg. 1,103 ft.

**CHILDRESS COUNTY**

Alma Oil Co.'s No. 1 Lowe, 660 ft. from N and W of SW¼, Sec. 417, Blk. H, W.&N.W. Sur., S of Kirkland.
T.D. 5,653 ft.; swbng. oil and wtr.; S.W. increasing in volume and temperature.
Larkins & Warr's No. 1 M. F. Williams, at common corners of Secs. 507, 483, 484 and 508, Blk. H, W.&N.W. Sur.
Drlg. 50 ft.

**COLLINGSWORTH COUNTY**

T. Hunter et al's No. 1 Hill, 330 ft. S and 180 ft. E. Sec. 19, Blk. 17, H.&G.N. Sur.
Drlg. 2,058 ft.; show gas 1,850-55 ft. and 1,910 ft.; increase at 1,940 ft.
Smith Bros.' No. 1 Pierce, C NE¼ Sec. 107, Blk. 21, H.&G.N. Sur.
Rigged up standard tools.

**COTTLE COUNTY**

Texas Co.'s No. 5 Johnson, 500 ft. N and 318 ft. W of most northerly cor. of J. A. Smith Sur.
Rig.

**DALLAM COUNTY**

Eben Warner's No. 1 Jarboe, 1,520 ft. from S line, 415 ft. from W line, Sec. 2, B.&B. Sur.
S.D. 3,200 ft.

**GRAY COUNTY**

Bell O. & G. Co.'s No. 1 Furneaux, 434 ft. from S and E lines of SE¼ of Sec. 110, Blk. B-2, H.&G.N. Sur.
Fishing 2,975 ft.; making ½ bbl. oil per hr.
Clark & Smith's No. 1-B Short, 126 ft. from N and 330 ft. from E of NW 40 acres, Sec. 2, Blk. 1, H.&G.N. Sur.
Location.
Drilling Exploration Co.'s No. 1 Lapold, 330 ft. S and W, Sec. 141, Blk. 3, I.&G.N. Sur Material.
Tom Doswell's No. 1 Herndon, 330 ft. from S and W lines of SE¼ of SW¼ of Sec. 166, Blk. 3, I.&G.N. Sur.
Rig.
Farlins et al's No. 1 Ball, 330 ft. from S and E lines of NW¼ of Sec. 6, Blk. 3, R.B. Sur.
Drlg. 1,236 ft.
Hagy et al's No. 1 Chadwick, 320 ft. N and E, Sec. 210, Blk. B-21, H.&G.N. Sur.
Location.
Harry Foster's No. 1 Johnson, 330 ft. from N and E lines of Sec. 21, L. L. Erwin Sur. Spudded and S.D.
Warner's No. 1 Taylor, 330 ft. N and W of SE¼ Sec. 8, Blk. 8, A. W. Wallace Sur.
T.D. 3,116 ft.; to test; 1,300 ft. oil in hole.
Jeffries' No. 1 Sailor, 330 ft. from N and E of E½ of NW¼ Sec. 81, Blk. 3, I.&G.N. Sur.
S.D. 3,354 ft.
McLaughlin et al's No. 1 Baggerman, 330 ft. from S and E of NW¼ Sec. 64, Blk. 3, I.&G.N. Sur.
Rig.
Phillips Pet. Co.'s No. 1 Saunders, 330 ft. from S and 345 ft. from W lines of S½ of NE¼ of Sec. 3, Blk. 1, B.S.&F. Sur.
T.D. 2,918 ft.; top pay 2,885 ft.; shot; putting on pump.
Plains Holding Co.'s No. 1 Morse-Gulf, 330 ft. S and W, Sec. 57, Blk. 25, H.&G.N. Sur.
Material
Vulcan Oil Corp.'s No. 1-A Kinnard, 1,180 ft. from N and 150 ft. from W lines of E½ of SW¼ of Sec. 41, Blk. 25, H.&G.N. Sur.
T.D. 2,533 ft.; shot with 360 qts.; C.O.

**HUTCHINSON COUNTY**

Barnsdall Oil Co.'s No. 1 Lewis, 330 ft. N and E of W½ of E½, Sec. 7, Blk. 23, B.S.&F. Sur.
Drlg. 580 ft.
Gulf Prod. Co.'s No. 1 Pitcher, 330 ft. N and W, Sec. 19, Blk. M-21, T.C. Sur.
Rig.
Huey et al's No. 1 Christian, 220 ft. from S and 330 ft. from W, Sec. 32, Blk. Y, A.&B. Sur.
T.D. 3,175 ft.; P.B. to 2,996 ft.; est. 6,000,000 to 8,000,000 ft. of gas.
Owl Oil Co.'s No. 1 Moore, 275 ft. S and W of NW 80 acres of NW¼, Sec. 21, Blk. M-21, T.C. Sur.
Drlg. 78 ft.
Phillips Pet. Co.'s No. 1 Daniel Dial, 330 ft. from S and 325 ft. from E lines of Sec. 36, Blk. M-23, T.C.R.R. Sur.
Location.
Power Pet. Co.'s No. 1 Hodges, 660 ft. S and E of most southerly 80 acres of S 160 acres of SE 200 acres, Sec. 16, Blk. M-35, T.C. Sur.
Rig.
Stinnett Oil Co.'s No. 1 Starnes, 330 ft. from N and 275 ft. from W of E½ of NW¼ Sec. 22, Blk. M-23, T.C. Ry Sur.
S.D. 600 ft.
Texas Plains Oil Co.'s No. 1 State, 2,500 ft. SW of SW cor. of Sec. 15, Blk. 47, H.&T. C. Sur., and 330 ft. from N bank of Canadian River.
Spudded and shut down.
Texilvania Oil Co.'s No. 1 Thompson, 440 ft. N and 2,735 ft. E, Sec. 15, Blk. M-23, T.C. Sur.
T.D. 3,027 ft.; putting on pump.

**KING COUNTY**

Davis, Heydrick et al's No. 1 Masterson, NE cor. Blk. 50, F. P. Knotts Sur.
Drlg. 3,775 ft.

**MOORE COUNTY**

Alma Oil Co.'s No. 1 Ward, 330 ft. N and W of SW¼, Sec. 63, Blk. 44, H.&T.C. Sur.
Drlg. 1,770 ft.

**OCHILTREE COUNTY**

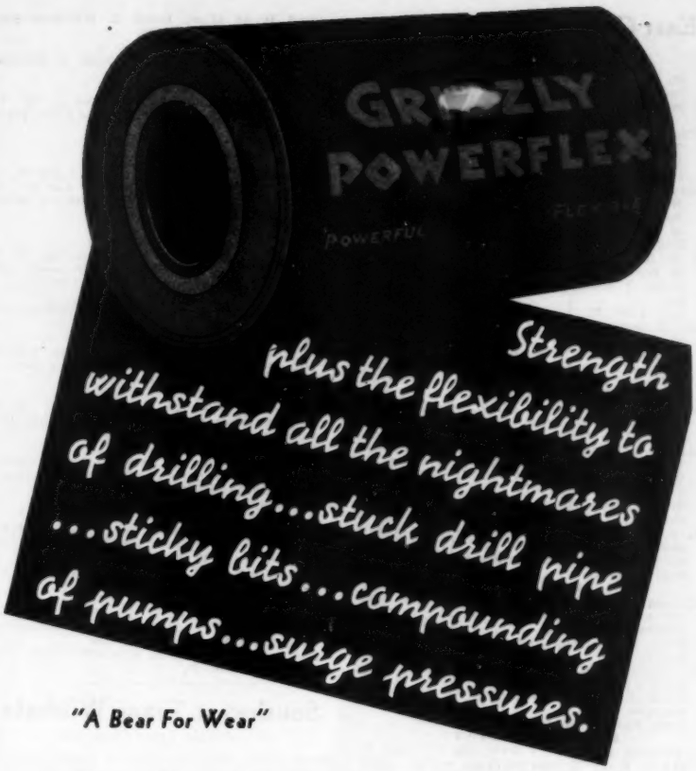
U. S. Oil Corp.'s No. 1 W. R. Norris, 330 ft. S and 990 ft. E, Sec. 312, Blk. 43, H. &T.C. Sur.
Rigged up.

**RANDALL COUNTY**

English et al's No. 1 Oxnard, 350 ft. from N and 1,320 ft. from E lines of NE¼ Sec. 85, Blk. 2, A.B.&M. Sur.
Drlg. 5,669 ft.

**WHEELER COUNTY**

C. & H. Drlg. Co.'s No. 1 Binkley, 330 ft. from S and W lines of NE¼ of Sec. 25, Blk. 24, H.&G.N. Sur.
T.D. 2,325 ft.; fishing.
Johnson et al's No. 1 Pryor, 330 ft. N and E of E½ NE¼ Sec. 48, Blk. 13, H.&G.N. Sur.
S.D. 2,245 ft.; H.F.W. 2,244-45 ft.
Martin & Dubose's No. 1 Schwarting, 330 ft. from S and 990 ft. from W lines of SE¼ of Sec. 53, Blk. 13, H.&G.N. Sur.
T.D. 2,700 ft.; shot; C.O.
Northern Texas Utilities' No. 1 Calhon, 330 from N and E of SE¼, Sec. 72, Blk. 13, H.&G.N. Sur.
Rigged up.
Phillips Pet. Co.'s No. 1 Binkley, 330 ft. N and 990 ft. W of W½ of SW¼, Sec. 49, Blk. 24, H.&G.N. Sur.
Drlg. 2,369 ft.
Smith Bros.' No. 1-B Harlan, 330 ft. from N and 990 ft. from W lines of W½ of SW¼ of Sec. 49, Blk. 24, H.&G.N. Sur.
T.D. 2,583 ft.; 400 bbls. oil in 5 days.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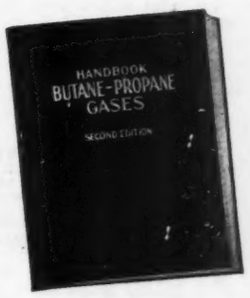


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## East Central Texas Wildcats

(Continued from Page 104)

ft. from N and E lines of 70-ac. tract, 1 mile SE of Miller Bros. A. Cavo Sur.
Washing to bottom; T.D. 2,950 ft.

**HUNT COUNTY**

Cauble & Thompson's No. 2 Y. B. Reed, F. Thweatt Sur., 160 ft. N of No. 1.
Began June 1; top Pecan 550 ft.; drlg. 560 ft.

Cauble & Thompson's No. 1 Reed, 330 ft. N of northerly NE cor. of C. B. Payne Sur., but in F. Thweatt Sur., 3 miles SE of Greenville.
Dry 3,535 ft.

J. F. Morrissey & Co., Inc.'s No. 1 Fry, 543 ft. from N and 300 ft. from E of 148-ac. tract, 7 miles N of Commerce, C. Davis Sur.
S.D. 1,690 ft.

H. G. Samson's No. 1 Phillips, 1,300 ft. E of Winan's No. 1 Phillips, University Lands Sur., 2 miles W of Commerce.
Elev. 522 ft.; top Woodbine 2,596 ft.; top rod beds 2,750 ft.; drlg. shale 2,880 ft.

**KAUFMAN COUNTY**

Germany et al's No. 1 Clark, 951 ft. N and 1,000 ft. W of tract, S. Eden Sur.
T.D. 1,780 ft.

Murry & Emerson's No. 1 G. W. Martin, 1,660 ft. from W and 250 ft. from N of 140-ac. tract, from W. L. C. Butler Sur., 2 miles NE of Kemp.
Cored green shale 820 ft.; S.D. 994 ft.; shale.

L. P. Kean's No. 1 J. B. Hunter, R. Sowell Sur., 300 ft. from SW and 150 ft. from SE of 50-ac. tract, 4 miles S of Terrell.
S.D. 3,400 ft.

**LEON COUNTY**

Killough & Tucker's No. 1 G. W. Lee, center of NE 10 acres of 230-ac. tract, J. Burleson Sur.
Elev. 303 ft.; top Pecan 3,875 ft.; S.D. 3,900 ft. ch.

H. Williams et al's No. 1 Henry, 155 ft. from SW and 501 ft. from NW of 125-ac. tract, R. Rogers Sur., 2 miles E of Normangee.
Drlg. lignite, sand and shale 3,060 ft.

**LIMESTONE COUNTY**

J. Edward Mills' No. 1 Hunt, 200 ft. from N, 350 ft. from W line 34.75-ac. tract, Israel Wood Sur., 2 miles NE of Kosse.
C.O. at 3,654 ft.

Doughtry et al's No. 1 S. Welch, 150 ft. from NW and 900 ft. from NE of 77.64-acre tract in A. Varilia Sur., 4 miles W of Groesbeck.
Bailing 3,004 ft.; show of gas.

Y. Rogers' No. 1 J. M. Tidwell, 330 ft. from S and E of 330-ac. tract, P. Varella Sur., 3 miles SW of Mexia.
Derrick.

**McLENNAN COUNTY**

Mahan et al's No. 1 Mann, 1,100 ft. W of Simms Oil Co.'s No. 1 Mann, Carlos Tampo Sur., W of Robertsonville.
S.D. 700 ft.

**NACOGDOCHES COUNTY**

Douglas Exploration Co.'s No. 1 Hayter, 1,687 ft. from S and 2,552 ft. from W lines of tract, Santos Coy Sur.
T.D. 4,290 ft.; ch. prep. to run S.L.M.

Morrow et al's No. 1 C. B. Watkins, 150 ft. from N line and 320 ft. from NW lines of 166-ac. tract, 3 miles S of Caro, H. Y. Bailey Sur.
S.D. 4,170 ft.

Stebbinger & Baker, trustee's No. 1 Mrs. A. Mattauer, 408 ft. from W and 607 ft. from N of 440-ac. tract, R. Totin Sur., 4 miles SE of Cherino.
Moving in rig.

**NAVARRO COUNTY**

Bennett Brothers' No. 1 T. E. Stewart, 150 ft. from NE line of lease, 10 miles SW of Corsicana, Wm. R. Bowen Sur.
T.D. 1,186 ft.; S.D.

R. B. Codding et al's No. 1 Lela Kent, 450 ft. from S line and center of N and S lines of lease, 3 miles NE of Chatfield, C. R. Emmons Sur.
S.D. 1,340 ft.

W. J. Keeling et al's No. 1 J. F. Rushing 484 ft. from N line and 150 ft. from W line of 134-ac. tract, 6 miles SW of Richardson, Henry Ford Sur.
T.D. 2,881 ft.

McCullough et al's No. 1 C. Berry, 330 ft. from SE cor. of 35-acre tract, 1 mile W of Dawson, William Moss Sur.
S.D. 1,182 ft.

E. M. Thomason & Co.'s No. 1 C. Morgan, 340 ft. from W and 520 ft. from N of 100-ac. tract, Wm. Haggard Sur., 1 mile SW of McGlothlin's No. 1 Dobbin.
S.D. 830 ft.

Wiggins et al's No. 1 Donoho, 450 ft. from N and 1,101 ft. from E lines in John Couple Sur., SW of Corsicana.
S.D. 1,439 ft.

**RAINS COUNTY**

Allen & McClung's No. 1 Giles, T. Cunningham Sur., Abst. 143, 330 ft. from W line and 200 ft. from N line of 105-ac. Giles tract, 5 mi. SW of Emory.
Derrick.

Allen & McClung's No. 1 Ida Bullard, N. Bramley Sur., 1,300 ft. from W line and 200 ft. from N line of 25-ac. tract, 2 mi. SW of Emory.
Derrick.

**RED RIVER COUNTY**

Joiner's No. 1 D. Rust, C. C. Wilborn Sur., 234 ft. N and 254 ft. W of most southerly SE cor. of Sur., just south of Avery.
Moving in rig.

**RUSK COUNTY**

Ben Lamb's No. 1 H. Leath, 330 ft. out of NW cor. of 185-ac. tract in L. J. Dooley.
T.D. 4,740 ft.; P.B. to 4,710 ft.; bailing and showing oil.

Richardson's No. 1 Wood.
Top Pecan 3,419 ft.; base Pecan 3,740 ft.; top Austin 4,215 ft.; S.D. 4,251 ft.; ch.

**SMITH COUNTY**

Cloud et al's No. 1 Dendall, 330 ft. from S and W of 55-ac. tract, J. Williams Sur., 3 miles E of Van Field.
S.D. 1,650 ft.

W. R. Harrison's No. 1 Rushing, J. Herring Sur. (O.W.D.D.).
Drlg. by junk 4,330 ft.

Sun and Hunt Prod. Co.'s No. 1 E. W. Judge, 330 ft. S and E of 55.5-ac. tract, 3½ miles SE of Tyler.
Began June 5; drlg. 50 ft.

**TITUS COUNTY**

S. Rotondi's No. 1 Lillianstun, 1,200 ft. E from NW cor. of J. Bodt Sur. and 330 ft. N, but in W. H. Crawford Sur., 5 miles NE of Talco.
Elev. 301 ft.; derrick.

**UPSHUR COUNTY**

Humphries' No. 1 J. H. Brown, 330 ft. N and E of NW cor. of J. H. Brown's 100-ac. tract, R. Wyatt Sur., 2½ miles south of Ore City.
Elev. 449 ft.; Pecan Gap chalk 2,420-2,065 ft.; top Austin 2,502 ft.

**VAN ZANDT COUNTY**

J. H. Foster et al's No. 1 Breucher, 330 ft. out of SE cor. of tract, D. Clapp Sur., 4 miles SE of Wills Point.
R.U. on new hole.

J. Boren et al's No. 1 Bryant, 483 ft. N of same operator's dry hole, Nacogdoches County School Land Sur.
S.D. 1,325 ft.

Boren et al's No. 2 Palmer, 544 ft. from S and 686 ft. from E of 69.5-ac. tract, Nacogdoches County School Land.
Standing; T.D. 1,324 ft.

**WOOD COUNTY**

Atlatl Royalty Corp.'s No. 1 J. B. Goldsmith, W. W. Lanier Sur., Abst. No. 358, 466 ft. from W line and 566 ft. from N line of 693.3-ac. tract and survey, 3½ mi. NW of Quitman.
Rigging up.

Dean Bros.' No. 1 W. H. Finkles, 550 ft. W of W line of J. Hunt Sur., B. Anderson Sur., 2½ miles SW of Yantis.
Elev. 383 ft.; began May 28; 10-in. 300 ft.; drlg. 2,468 ft.

## Southwest Texas Wildcats

(Continued from Page 99)

Santa Clara Oil Co.'s No. 1 Wood-Welder, 2,200 ft. W line, 330 ft. N line, Sec. 385, T.D. 2,481 ft.; I.P. 28 bbls. per hr.; tubing pressure 625 lbs.; csg. pressure 825 lbs.

**FAYETTE COUNTY**

Ross Fenton's No. 1 Kasper (263-ac), 3,000 ft. from NE line, 1,320 ft. from SW line, of Thos. Green Sur. No. 28.
Checking tities.

**FRIO COUNTY**

W. T. Shoemaker's No. 1 M. Roche, 150 ft. SW cor. of Carl Wenzel Sur. No. 139.
Standing in Edwards lime 3,743 ft.

**GOLIAD COUNTY**

Keystone Royalty Co.'s No. 1 M. Woods, SW part of county, 15,000 ft. from SW line, 5,000 ft. from NW line of J. Sherman Sur.
S.D. 4,231 ft.

Turnbull & Irwin's (Walter Taber et al) No. 1 Handley, 370 ft. S, 100 ft. E of NE cor. of 2,400-ac. tract, in Daley Sur.
Drlg. 530 ft.

**GUADALUPE COUNTY**

Bob Gode et al's No. 1 Hicks, 1,320 ft. from E line, 150 ft. from S line of 189-ac. tract in Santo Y. Coy Sur.
Spudded.

A. D. Locke's No. 1 Lowman, 210 ft. from SE and SW lines of 2,500-ac. tract in C. Campbell Sur.
T.D. 1,314 ft. in Edwards; 6⅝-in. at 665 ft.; set 2½-in. tubing.

Mineral Oil Corp. of Texas' No. 1 Allen Phillips, 162 ft. from N line, 900 ft. from E line of tract, Cortinos Sur.
S.D. 862 ft.

W. A. Scrutchin's No. 1 A. H. Smith, 150 ft. from E line, 1,350 ft. from N line of 34.5-ac. tract, Jas. B. Cowan Sur.
Drlg. shale 550 ft.

J. S. Suttle's No. 2 Baenziger, S of Seguin. Old well; R.U. to W.O.

Suttle et al's No. 1 Baenziger, 700 ft. from S line, 500 ft. from E line of 125-ac. tract, Monsola Sur.
T.D. 2,153 ft.; tested small show oil; treating with acid.

W. J. Walton's No. 2 Zaboroski, 180 vrs. (500 ft.) SW of No. 1, 190.8 vrs. (530 ft.) S of Guadalupe River, 225-ac. tract, J. D. Clements Sur. No. 14.
Drlg. 1,110 ft.; D.S. test 810-40 ft.; est. 750,000 ft. gas.

**HIDALGO COUNTY**

Bluff Pet. Co.'s No. 1 Porcion Land Co., 330 ft. from N and E lines of NE 100 acres of S 500 acres of Share 14, Por. 49.
Drlg. 600 ft.

E. A. Davis' No. 1 Flores, 65 ft. from N line, 25 ft. from W line, Tract 312, Porcion 38.
Drlg. 2,900 ft.

Downey & Morton's No. 1 Daskom, 450 ft. from E line, 55 ft. from S line of Blk. 34, Por. 45.
T.D. 4,415 ft.; tested S.W.; may recmt. to shut this off.

Nedler & Graham's No. 1 Oscar Daskam, center of Blk. 42, Porcion 45.
Derrick wrecked.

E. L. Smith's No. 1 A. Flores, Tract 250, Porcion 38, 1 mile NW Sam Fordyce Field.
Abd. 4,500 ft.

**JIM HOGG COUNTY**

Darby Pet. Co.'s No. 1 Holbien, 330 ft. out of SW cor. of Lot 57, Sur. 5, Los Animas grant.
Drlg. below surface csg.

French Oil Co.'s No. 2 T. T. East, 330 ft. from NE and NW lines, Blk. 74, Subd. No. 2 Las Moritas grant.
Abd.; depth not reported.

Miller & Pippin's No. 1 Yeager, 527 ft. S line, 150 ft. E line of Blk. 6, Sur. 20.
Fishing 2,536 ft.

A. W. Phillips' No. 1 Allen, 660 ft. from S and E lines of Blk. 293, Pippin Subd. of the Randado grant.
Moving in material.

Sun Oil Co.'s No. 1 L. R. Brooks, 7,500 ft. from N and W lines of tract, Santo Domingo de Abajo grant.
Drlg. below surface csg.

**JIM WELLS COUNTY**

Sunray Oil Co.'s (A. M. Hagan) No. 1 Robert Adams, 330 ft. N and E of SW cor. Sec. 10, M. Ruiz Sur.
R.U.; completing wtr. well.

Smith & Story's (Maer & Shira) No. 1 Schaefer, 1,320 ft. E of NW cor. center of Blk. 15, of subdivision of ranch.
S.D. 5,502 ft.

**KARNES COUNTY**

Jim Kendrick's No. 1 Radford, J. Pointevent Sur. on the Seegter tract.
S.D. 3,100 ft.

W. C. McBride's No. 1 Boultinghouse, 642 ft. from SE line, 618 ft. from SW line of J. S. Menefee Sur.
Drlg. below surface csg.

H. A. Pagenkopg's No. 1 T. J. McAda, 330 ft. from NE and NW lines of Tract C, Martinez Sur.
Abd. 6,253 ft.

Harry Sample's No. 1 Seeger, 330 ft. from W line, 330 ft. SW of road, J. Pointevent Sur.
Drlg. 2,770 ft.

R. G. Tonkin's No. 2 Henke, 2,670 ft. from SW cor., 330 ft. from W line (location changed).
Location site cleared and pits completed.

**KERR COUNTY**

Emerald Oil Co.'s (Meteor Oil Co.) (Edminton & Walker) No. 1 Whitworth, 1,160 ft. from S line and 1,322 ft. from E line of Sec. 1,439 of the H.E.W.T. Sur.
S.D. in lime 800 ft.

G. F. Schreiner et al's No. 3 Jeff Love, 1,500 ft. SE of No. 1 and 1,530 ft. from SE cor. and 300 ft. from N line of Sec. 1,591.
T.D. 5,625 ft.; porous lime; S.W. 5,622-25 ft.; S.D.

**KLEBERG COUNTY**

Parr & Ponder's No. 1 Sam Michalk et al, 5 miles SE Kingsville.
S.D. 1,050 ft.

**LASALLE COUNTY**

Killingsworth Oil Co.'s No. 1 Yeager, Sur 94.
T.D. 2,012 ft.; sand 1,499-1,710 ft.; cmtd. csg.; standing.

**LEE COUNTY**

Jas. E. Pederson's No. 1 Turner, 1,860 ft. from N line, 150 ft. from E line of tract, David Hudson Sur.
T.D. 6,560 ft.; P.B. to 6,150 ft.; preparing to perforate csg.

Scharbach & Stowe's No. 1 Robert Otto.
Sand 2,450 ft.; small show oil; standing.

**LIVE OAK COUNTY**

Benco Oil Corp.'s No. 1 E. Mahoney, 2,109 ft. SW, 150 ft. NE of NE cor. of lease where NE cor. and Callihan and Three Rivers roads meet, Mark Killelly Sur.
Spudded.

Orbit Drlg. Co.'s (Baugh & McMillan) No. 1 Walton & Campbell, 1,500 ft. NE line and SE line of D. R. Fant Sur.
Abd. 4,831 ft.

Henderson Coquat's No. 1 Reagan, McGloin Sur., E of Nueces River and S of Orkville.
Drlg. 1,560 ft.

Henderson Coquat's (Luling O. & G. Co.) No. 1 Rex, 330 ft. from SE and SW lines of 629-ac. tract, C of SW¼ of G.H.&H. Sur., Abst. 197, 3 miles S of Mileska.
T.D. 5,502 ft.; running Schlumberger test.

Lefevre, Spice & Feltner's No. 1 Carter Inv. Co. (Chappa ranch), 330 ft. from SW cor. NE¼ of Sec. 299, Hooper & Wade Sur.
Coring shale 2,166 ft.

Turner & Walker's No. 1 Dr. Simmons, 50 ft. from N line, 300 ft. from W line of subd., S. Mayes Sur., Farm Tract 513, Blk. 12.
Rigging up.

J. O. Whittington's No. 1 Little, 1,320 ft. NE of S cor. of M. M. Shipp Sur., 330 ft. N of S line.
T.D. 5,758 ft.; testing upper sands.

**McMULLEN COUNTY**

John O. Gibson's No. 1 Mazur & McDowell, 330 ft. from N and W lines, Sec. 19, Blk. 4, H.T.&B. Sur.
Set csg.; W.O.C. 130 ft.

J. O. Gibson's No. 1 G. C. West (Lowe), 150 ft. E line, 1,200 ft. S of NW cor. of Lot 1, Blk. 4, H.T.&B. Sur.
S.D. 465 ft.

Henderson Coquat's No. 1 Exzell, midway N and S lines, 2,000 ft. from SE line, D. R. Fant Sur.
Set csg. 765 ft.; W.O.C.

Howard & Carpenter's No. 1 Jungman, 1,030 ft. from E line, 950 ft. from S line, Holy Sur.
Testing 980 ft.

Chas. A. Hall's No. 1 B. C. Claunch, 368 ft. from N line, 160 ft. from E line of 25-ac. tract, Michael Haley Sur.
Location.

Loma Oil Co.'s No. 1 Dickinson, Sparks Sur., 800 ft. NE line, 1,180 ft. SE line, Lot 13.
Drlg. rock.

Pointe et al's No. 1 Fahler, 432 ft. S line, 819 ft. E line of tract, Byrna pasture.
Standing 785 ft.

C. C. Shumway's No. 3 Shiner, 330 ft. out of NE cor. of SE¼ of Sec. 53, C. C. Shumway Subd.
1,020 ft.; no report.

**MEDINA COUNTY**

Joe Dupree's No. 1 Batto, 258 ft. from E line, 957 ft. from N line, J. Ball Sur. No. 1,475.
Drlg. shale 452 ft.

O. L. Gates and H. W. Hill, Jr.'s No. 1 Odom, 300 ft. from W line, 600 ft. from N line of H. Castro Sur. 174.
Rigging up.

W. T. Shoemaker's No. 1 Noonan, 52.5 ft. S 2 deg. 30 ft. E of old well, Sec. 349, M. Simon Sur.
T.D. 445 ft.; cmtd. 8-in. csg. 300 ft.; R.U. rotary.

**REAL COUNTY**

H. J. Heartwell et al's No. 2 Mrs. M. S. Perry, 250 varas from NW line, 775 varas from SW line of A.B.&M. Sur. No. 176.
Black shale 3,115 ft.; fishing.

**SAN PATRICIO COUNTY**

Masterson et al's (Tom Graham) No. 1 Wurzbach, 330 ft. from W line, 4,350 ft. from S line of C. C. Hornsby Sur.
Standing 5,521 ft.

**STARR COUNTY**

Accumulated Royalties' No. 1 Ferry, Lot 8, Blk. 2, B.&B. Subd., Por. 86.
W.O.C. 100 ft.

Armstrong, Emmanuel & Adams' No. 1 S.C. C.C., 330 ft. from S and E lines of Blk. 57, Porcion 88-89.
T.D. 2,740 ft.; hole swbd. dry; P.B. to 2,240 ft.; to perforate.

C. R. Borah's No. 1 A. Guerra, San Jose grant, 330 ft. from N and 150 ft. from E lines of Sec. 6 (NE part of county).
S.D. 3,300 ft.

John H. Clopton's No. 1 Mrs. A. M. Kelsey-Bass, 2,950 ft. from W line, 3,610 ft. from E line of Porcion 88 in Porcion 86, Jurisdiction of Camargo.
Ready to spud.

John H. Clopton's No. 1 Dioncia Lopez de Tijerina, Blk. 4, Tract C-14, Porcion 80.
Abd. 3,942 ft.

Heep Oil Co.'s No. 1-A Guerra, Blk. 35, 30 ft. S from No. 1, Porcion 55.
Abd. 3,505 ft.

Henshaw Bros.' (Sunray Oil Co.) No. 1 Sanchez, 330 ft. from NE and NW lines of 40-ac. tract, Sur. 344.
Drlg. 1,100 ft.

Hiram Reed's No. 1 Block Bros., Tract A-38, Porcion 80, Blk. 4.
S.D. 1,540 ft.; oil sand 1,490-1,501 ft.

Sun Oil Co. and Humble's No. 1 Mantor & Briggs, 660 ft. from NE line, 657 ft. from NW line of A.B.&M. Sur., NW¼ of NW¼ of Sur. 53.
Dry and abd. 4,027 ft.

**WEBB COUNTY**

Mills Bennett's No. 1 Jesus Lopez, Jr., 2,500 ft. S line, 1,320 ft. W line of Sur. 73.
Rigging up.

Payne et al's No. 1 Hoggterp, 450 ft. from SE line, 300 ft. from NE line, Blk. 5, Sur. 1,110, W of Oilton.
S.D. 1,982 ft.

Arthur H. Wray's No. 1 Geo. Stuempke, Share 1, Brewster pasture, Galan grant.
Drlg. 1,125 ft.; moving in electric rig; (corrected depth).

**WILLACY COUNTY**

W. T. Daniel's No. 2 Armendiaz, near Rio Hondo, 7,795 ft. from E and W lines of Share 14.
S.D. 3,770 ft.

Kingwood Oil Co.'s No. 1 Santa Rosa, Inc., 160 ft. from E line, 637 ft. from S line of Sec. 30, Blk. 16, Share 44, San Juan de Carricitas grant.
Drlg. 2,930 ft.

**WILLIAMSON COUNTY**

Fuchs & Walters' No. 1 S. Allmon, John Bevil Sur. No. 56, 150 ft. from SW line, 300 ft. most westerly SW line of 264-ac. tract.
Fishing 93 ft.; hole caving; S.D.

H. L. Goff et al's No. 1 Alberta Klotz, 1,700 ft. from N line, 150 ft. from E line of 100-ac. tract, W. Cartwright Sur.
S.D. 1,250 ft.; may drill to Edwards.

Hays et al's No. 1 Pfluger, 150 ft. from E line, 150 ft. from S line, White Sur.
S.D. 915 ft.

Rue et al's No. 1 Chas. Bachmayer, 6 miles SE Taylor.
Rigging up.

**ZAPATA COUNTY**

F. H. Crow et al's No. 1 Daniel Yzaguirre, 330 ft. out of SW cor. Share 1, Porcion 14-15-16, D. Yzaguirre tract.
Drlg. 2,015 ft.

Danvers & Harrison's No. 1 D. A. McAskill, 660 ft. SE and SW lines, Blk. 51, Edwards Subd., Borrego grant.
Set and cmtd. csg. 20 ft.

Humble O. & R. Co.'s No. 1 Eulalie Dominguez, 12,785 ft. from NE line, 1,320 ft. SE line of Por. 31.
Location.

Joe Palmer's No. 1 Emma A. Markrud, 150 ft. from NE and NW lines, Blk. 22, Sur. No. 616.
Rigging up.

Texas Royalty Investment Co.'s No. 1 N. J. Vela, 686 ft. from NE line, 300 ft. from NW line, Blk. 7, Por. 29.
S.D. 2,338 ft.

## Southwest Texas Proven

**Week Ending June 8**

**CARROLL—BASTROP COUNTY**

Nelson Puett's No. 5 Carroll Estate, 1,926 vrs. (5,350 ft.) from NW line and 619.20 vrs. (1,720 ft.) from SW line of Andrew Mayes Sur. No. 19.
Drlg. shale 926 ft.

**CEDAR CREEK—BASTROP COUNTY**

J. E. Mills' No. 2 H. H. Lytton, 225 ft. NW line, 825 ft. SW line, 320 acres, J. A. Navarro Sur.
Drlg. shale 1,501 ft.

**BATEMAN—BASTROP COUNTY**

Batts & Jarnson's No. 1 Mrs. Anneta Harris, 576 vrs. (1,600 ft.) NW line, 630 vrs. (1,750 ft.) SW line, John Maxmillan Sur. 22
S.D. 235 ft.

**CAESAR—BEE COUNTY**

El Toro Oil Co.'s No. 1 J. J. Grisson, 150 ft. from N and W lines of 10-ac. tract, P. B. Early Sur.
Spudded.

El Toro's No. 3 Gardner, 150 ft. from N and W lines of lease, F. Lewis Sur.
T.D. 3,025 ft.; comp.; average well.

McAlester Fuel Co.'s No. 2 W. J. Vaughn, 150 ft. from SE line, 300 ft. from SW line of 52.37-ac. tract, F. Lewis Sur.
Rigging up.

Swiger et al's No. 4 Gardner, W offset to Vaughn producer.
Moving in material.

# STAINLESS STEEL CASTINGS CO.
## of America, Inc.

**Producing . . . CARBON as well as STAINLESS and other ALLOY STEEL CASTINGS**

**COMPETITORS**

AS WELL AS HIS OLD CUSTOMERS—proclaim Leo G. Smith who heads our company—as a master in the art of steel foundry work in all its branches.

**HIS EXPERIENCE**

gained throughout this country—as well as in the Dominion of Canada—where European steel foundry practice was of necessity acquired to meet competition—fits the head of our company in a particularly excellent manner to successfully handle all problems met with in a jobbing steel foundry.

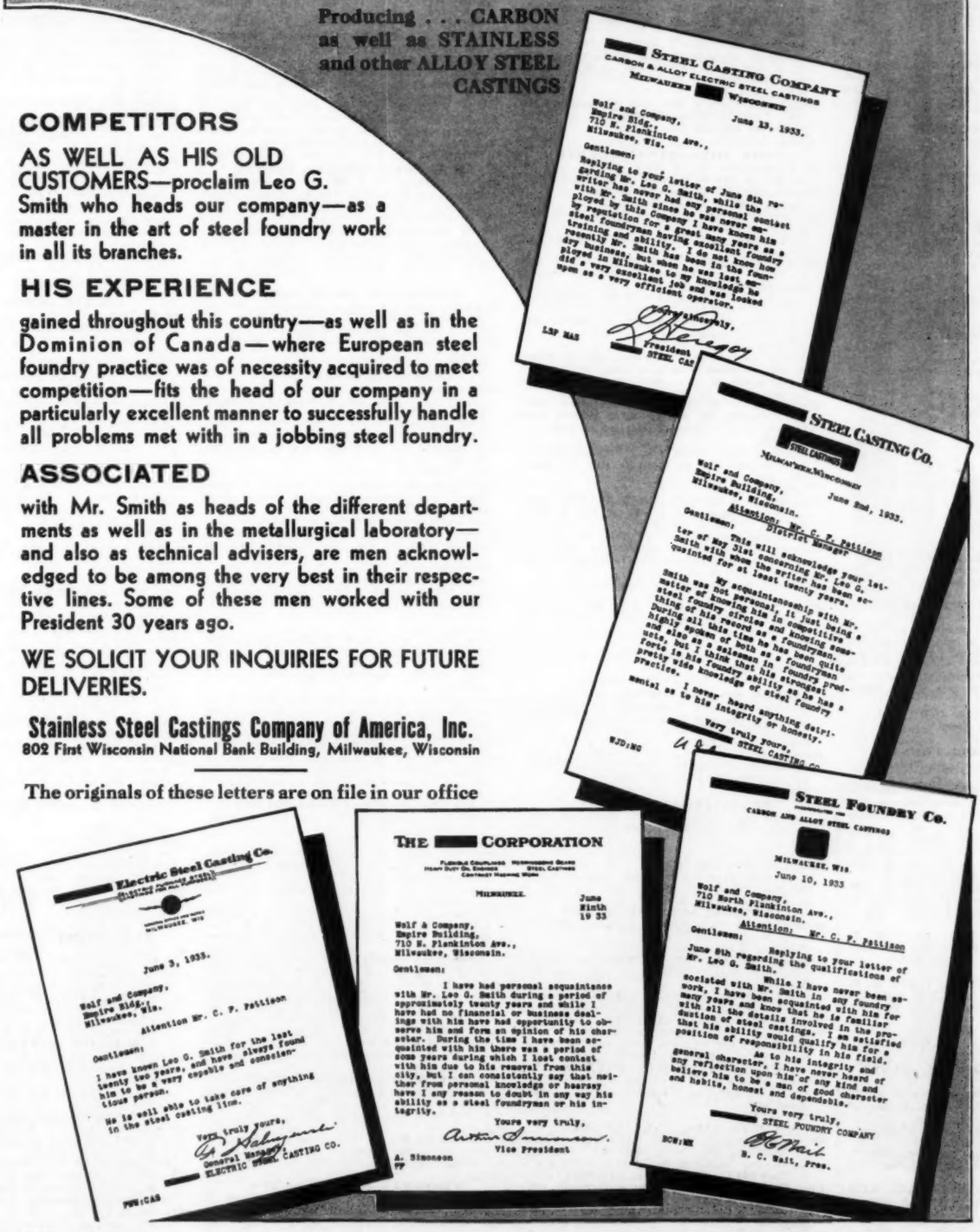
**ASSOCIATED**

with Mr. Smith as heads of the different departments as well as in the metallurgical laboratory—and also as technical advisers, are men acknowledged to be among the very best in their respective lines. Some of these men worked with our President 30 years ago.

WE SOLICIT YOUR INQUIRIES FOR FUTURE DELIVERIES.

**Stainless Steel Castings Company of America, Inc.**
802 First Wisconsin National Bank Building, Milwaukee, Wisconsin

The originals of these letters are on file in our office




THERE IS NO SUBSTITUTE FOR EXPERIENCE

**DIRKS—BEE COUNTY**

Dirks Bros. and Jamison's No. 1 Campbell. Drlg. 2,400 ft.

Dirks Bros.' No. 2 Harris, 990 ft. from E line, 330 ft. from N line, J. L. Dugat Sur. Sand 3,889-3,904 ft.; comp.; flowing 35 bbls. per hr.; ¼-in. choke.

Highland Oil Co.'s No. 1 P. L. Campbell. 330 ft. from NE line, 540 ft. NW of No. 3, W. B. Blanchard Sur. Sand 2,953-57 ft.; I.P. 250 bbls. per day; ¼-in. choke.

Home Oil Co.'s No. 3 Bassinger, 330 ft. from E line, 660 ft. due S of No. 2, Sec. 7, J. M. Uranga grant. Coring for Pettus 3,800 ft.

Home Oil Co.'s No. 4 Bassinger, 330 ft. from S and E lines of Sec. 7, J. M. Uranga grant. Sand 3,827-38 ft.; I.P. 25 bbls. per hr.; ¼-in. choke.

Mills Bennett Prod. Co.'s No. 3-A Bassinger, 330 ft. from N line, 660 ft. from W line of NE¼ of NW¼ of Sec. 7, J. M. Uranga grant. Sand 3,861-73 ft.; comp. but not ganged.

**PETTUS—BEE COUNTY**

L. T. Barrow's No. 3-A McKinney, S 65 deg. E 1,500 ft. from No. 2-A. 1,200 ft.; no report.

United Prod. Co.'s No. 50 Ray, approx. 2,100 ft. northwesterly from NW cor. of Pierce Miller Sur., thence 540 ft. southwesterly at R/A; also 4,825 ft. SE from NW property line of lease, Geo. A. Kerr Sur. Drlg. 3,750 ft.

**RAY—BEE COUNTY**

Dirks Bros.' No. 2 Ray. W.O.C.; Sand 3,931-35 ft.

Magnolia Pet. Co.'s No. 1 Geo. Ray, 150 ft. from E line, thence 1,220 ft. from S along E line to NW line of survey, W. B. Blanchard Sur. Moving in material.

**TULETA—BEE COUNTY**

Mills Bennett Prod. Co.'s No. 1-B C. W. Bassinger, 256 ft. from W line, 330 ft. from S line of SE¼ of NW¼ of Sec. 7, Ragley Subd., Uranga grant. Drlg. sand; (no depth given).

Leslie McKay's No. 3 Campbell, 150 ft. from E line, 330 ft. from S line of W½ of Blk. 21, Brooks & Burleson Sur. Cmtd. csg. in sand 3,842-47 ft.

Southwest Exploration Co.'s No. 1 Heyden & Bruckhan, C of farm tract, 330 ft. from N and W lines of Sec. 20, Uranga grant Rigging up.

Texas Co.'s No. 1 Young, 2,175 ft. W, 330 ft. N of SE cor. of T. J. Butler Sur. 10-in. csg. at 284 ft.; 3,540 ft.; no report.

Wrightsman Oil Co.'s No. 1 Kimball, 1,200 ft. from NW line, 1,500 ft. from NE line, S. Winship Sur. Cored sand; set csg. 3,542 ft.

**DOBROWOLSKI—BEXAR COUNTY**

D. C. Pegg and B. Miller's No. 7 Katie Strunk, 391 ft. from SW line and 304 ft. from NE line, 139.65-ac. tract, Juan Montez Sur. Rig.

**VON ORMY—BEXAR COUNTY**

Owens et al's No. 2 Owens, 1,900 ft. SN line, 700 ft. EW line of lease, 158.7 acres, S. Jett Sur. No. 53. T.D. 717 ft.; sand 655-85 ft.; 6⅝-in. csg. at 621 ft.; comp.; 5 bbls. daily.

T. and C. Owens' No. 1 Trawalter, 150 ft. W of river, 150 ft. from S line of tract No. 15, A. G. Trawalter Subd. Spudded; no report.

Joe H. Parker's No. 1 James McClosky, 1,500 ft. N line, 475 ft. W line, F. A. Desafire Sur. No. 134. Shale 250 ft.; S.D.

A. J. Trawalter's No. 11 fee. Moving in material.

**BRUNER—CALDWELL COUNTY**

Dawn Oil Corp.'s No. 2 Floyd Tiller. Derrick.

**DUNLAP—CALDWELL COUNTY**

O. B. Cunningham's No. 1 J. M. Pierce, 150 ft. from S and W lines of tract in S. Seale Sur. Testing 2,269 ft.

W. T. Walker's No. 1 Walker, S. Seale Sur. Chalk 2,171 ft.; comp.; pumping 80 bbls. daily.

W. T. Walker's No. 2 Walker, 300 ft. SW No. 1, 150 ft. NW line, 47-ac. tract, S. Seale Sur. No. 8. Rig.

Exploration Co.'s (F. Meyers) No. 1 W. T. Mooney, 310 ft. from S line, 450 ft. from W line of 95-ac. tract, S. Seal Sur. S.D. 2,150 ft.

Bellard & Whiting et al's No. 1 Mrs. A. C. Bridges et al, 450 ft. from NW line, 450 ft. from NE line of Soloman Seal Sur. Drlg. shale 635 ft.

W. F. Moseley's No. 1 J. M. Pierce. T.D. 2,242 ft.; chalk; 6⅝-in. csg. 2,050 ft.; drilled plugs; bailing.

**GOVERNMENT WELLS POOL—DUVAL COUNTY**

Georgia F. Hill's No. 1 W. J. Nester, 357.35 ft. from E line, 353.55 ft. from S line of SE¼ of NE¼ of Sec. 47. T.D. 2,276 ft.; sand 2,263-76 ft.; set csg.; W.O.C.

Kane Prod. Co. et al's No. 1 Peters, 990 ft. W line, 330 ft. N line of SE¼ of Sur. 176. Rigging up.

Magnolia Pet. Co.'s No. 46 D.C.R.C., 2,310 ft. from W line, 2,970 ft. from S line of Sur. 208. Location.

Magnolia Pet. Co.'s No. 45 D.C.R.C., 2,970 ft. from S line, 2,310 ft. from E line, Sur. 208, J. Poitevent Sur. Sand 2,519-21 ft.; set csg.; W.O.C.

Magnolia Pet. Co.'s No. 1 Riggs, 330 ft. from N and W lines of NE¼ of NE¼ Sur. 46. W.O.C. 2,353 ft.

Magnolia Pet. Co.'s No. 13 Riley, 990 ft. W line, 1,650 ft. S line of SW¼ of Sur. 45. Sand 2,189-93 ft.; coring 2,243 ft.

Magnolia Pet. Co.'s No. 11 J. W. Riley, 990 ft. from S and W lines, Sur. 45. T.D. 2,275 ft.; I.P. 150 bbls. per day on pump.

Parr Oil Corp.'s No. 2 R. E. Glover, 330 ft. from N and E lines of SE¼ of SE¼ of Sec. 44, J. Poitevent Sur. Location.

G. G. Porter's No. 2 Smith, 330 ft. from N and E lines of NW¼ of NE¼ of Sur. 46. Set csg.; W.O.C. 2,842 ft.

Simpson-Fell Oil Co. et al's No. 3 L. B. Moody, 990 ft. from N line, 330 ft. from E line of 100-ac. tract, G.B.&C.N.G. Sur. No. 60. Rigging up.

**SARNOSA—DUVAL COUNTY**

Sun Oil Co.'s No. 10 Cuellar Motor Co., 990 ft. SE line, 1,650 ft. NE line of E½ of Sur. 576. Location.

Sun Oil Co.'s No. 9 Cuellar Motor Co., 990 ft. from NE line, 990 ft. from SE line of Sec. 576, B.S.&F. Sur. Sand 2,397-4,404 ft.; T.D. 2,421 ft.; testing.

**HOFFMAN—DUVAL COUNTY**

Bridwell Oil Co.'s No. 1 Sutherland, 1,650 ft. from E line, 990 ft. from S line, of E½ of Sur. 122. Rigging up.

Conway & Butscher's No. 2 Hoffman, 330 ft. S, 325 ft. E of SW cor. of Sur. 120 in Sur. No. 116. S.D. 3,014 ft.

Duval Oil Corp.'s No. 1-A Bishop Cattle Co., 1,650 ft. from E line, 330 ft. from S line of Sec. 70. Abd. 3,200 ft.

**LOMA NOVA—DUVAL COUNTY**

Al Buchanan's No. 5 Ruiz, 660 ft. due W of No. 3, 660 ft. due N of No. 2, 162-ac. tract, Sec. 73, J. Pointevent Sur. Cored sand S.O. 2,675-84 ft.

Al Buchanan and Bianco's No. 4 Ruiz, 660 ft. W of No. 2. T.D. 3,116 ft.; perforated 3,105-09 ft.; testing.

Byrd & Campbell's No. 7 P. T. Wright, 330 ft. from S and E lines of 132.5-ac. tract, Blk. 10,468, Sur. No. 101. T.D. 3,646 ft.; sand 2,520-36 ft.; drilling in.

Duval Oil Co.'s No. 1 Hubbard, Morris & Cummings Sur., Sec. 77, 330 ft. out of NE cor. NE¼ section. Rigging up.

Frank J. Gravis' No. 1 Byland, 330 ft. from N and W lines of Blk. 4, Sur. 78. Sand 2,578-85 ft.; set csg.; tested 16 thribbles oil; 50 lbs. 8 min.; W.O.C.

Humble O. & R. Co.'s No. 1 Hubbard, B.S. &F. Sur. No. 84; 990 ft. E of W line and 330 ft. N of S line of N½ of section. Derrick.

Humble O. & R. Co.'s No. 2 Welder, 990 ft. from S line, 330 ft. from W line of tract, Sur. 73. Drlg. 1,975 ft.

Humble O. & R. Co.'s No. 3 M. Vela, 330 ft. from S line, 710 ft. W of No. 2, N½ Sec. 42, T.T.R.R. Co. Sur. Sand 2,702-14 ft.; I.P. 37 bbls. per hr.

Stieren Oil Corp.'s No. 1 Wright et al, S offset to Buchanan's No. 1 Ruiz, 330 ft. out of NE cor. of Sur. 72. T.D. 2,716 ft.; comp.; flowing 150 bbls. in 12 hrs.

E. R. Thomas et al's No. 1 C. W. Hahl, J. Pointevent Sur., Sec. 62, 330 ft. out of SE cor. of SE¼ section. Rigging up.

Texas Co.'s No. 4 Vela, 330 ft. from S and E lines, Sur. 42. T.D. 2,742 ft.; I.P. 15 bbls. per hr.

**SEVEN SISTERS—DUVAL COUNTY**

Dulce Oil Co. and Henderson & Harvey's No. 1 Serna, 150 ft. from E line, 330 ft. from N line of NW¼ of Sec. 284. Drlg. shale 1,701 ft.

Humble O. & R. Co.'s No. 1 Bank of Fredericksburg (Wright), 1,645 ft. from S line, 990 ft. from E line, Sur. 382. Derrick.

**PEARSALL—FRIO COUNTY**

Amerada Pet. Corp.'s No. 1 Kathman, 500 ft. from N and W lines of B. L. Crouch Sur. Derrick.

Amerada Pet. Corp.'s No. 1 W. H. Smith et al, 4,500 ft. from NE line, 1,650 ft. from SE line, Joseph V. Mason Sur. No. 322. Drlg. sandy lime 4,356 ft.

**LULING—GUADALUPE COUNTY**

Grayburg Oil Co.'s No. 14 McKean, 700 ft. from No. 12, Cottle Sur. Standing 1,854 ft.

Grayburg Oil Co.'s No. 15 McKean, 200 ft. from NW line, 150 ft. from SW line, H. Cottle Sur. Chalk 1,675-82 ft.; 6⅝-in. csg. at 1,675 ft.; showed oil 1,679-82 ft.; drlg. plug.

**DAISY CREEK—GUADALUPE COUNTY**

Texas Co.'s No. 2 Posey (workover). Old T.D. 2,696 ft.; set 7-in. csg. at 2,575 ft.; T.D. of sidetracked hole 2,583 ft.

**DINERO—LIVE OAK COUNTY**

Marine Oil Co.'s No. 1 Adair, 330 ft. from N and W lines of 366-ac. tract in J. McGloin Sur. S.D. 5,245 ft.

**LUCAS—LIVE OAK COUNTY**

Houston Oil Co.'s No. 32 Cartwright, 1,124 ft N of No. 31, Trudo Sur. 5½-in. csg. at 5,364 ft.; W.O.C. 6,787 ft.

**McNEILL—LIVE OAK COUNTY**

Lion Oil Ref. Co.'s No. 5 P. E. McNeill, 330 ft. from NW line, 1,350 ft. from SE line of G.H.&H. Sur. in Jane Curry Sur., Blk. 9, Location.

Darby Pet. Co.'s No. 1 McNeill, 330 ft. out of NW cor. of 116-ac. lease, 1,200 ft. SE of Lion's No. 1. Coring sand and shale 4,445 ft.

**SAM FORDYCE—HIDALGO COUNTY**

Ben G. Barnett et al's No. 2 Missouri Pacific, 1,000 ft. E of W line of right of way. Spudded.

Cortes Oil Co.'s No. 2-C Smith, 230 ft. from N line, 690 ft. from W line of NE 40 acres of Tract B-3, Porcion 41. Location.

Cortes Oil Co.'s No. 3-C Smith, 230 ft. from N line, 1,150 ft. from W line of NE 40 acres of Tract B-3, Porcion 41. Location.

Cortes Oil Co.'s No. 1-C Smith, 230 ft. from N and W lines of NE 40 acres of Tract B-3, Porcion 41. Sand 2,749-62 ft.; comp.; estimated 300 bbls. daily; pinched to ½-in. choke for allowable; 65 lbs. on tubing.

Double D. Oil Co. and Harrison's No. 2 Lula George, 230 ft. from W line, 690 ft. from S line of SW 40 acres of Tract 13, Porcion 41. Coring 2,875 ft.

Gem Oil Co.'s No. 2-A Seabury, 330 ft. from N line, 307 ft. due W of No. 1, Tract 256, Porcion 38. T.D. 2,771 ft.; installing valves.

Harrison et al's No. 2 (4) Guerra, 330 ft. from S and E lines of S 40 acres of Share 12, Porcion 41. W.O.C. 210 ft.

W. F. Lacy's No. 1 V. R. deFlores, 75 ft. from N line, 107 ft. from E and W lines, Blk. 266, Porcion 38. W.O.C. 3,787 ft.

H. J. Porter's No. 2 C. E. Smith, N end of 8¼ of tract in Tract 278, Porcion 40. Spudded; S.D.

Rogers Oil & Gas Co.'s No. 3-B Guerra, 516 ft. from E line, 150 ft. from S line, Tract 254, Porcion 40. T.D. 2,760 ft.; I.P. 100 bbls. per day.

Showers & Moncrief, Inc.'s No. 2 C. E. Smith, 230 ft. from N line, 164.2 ft. from E line of Share 3-B, Porcion 41. T.D. 2,754 ft.; I.P. 75 bbls.; ¼-in. choke.

**MERCEDES—HIDALGO COUNTY**

Union Sulphur Co.'s No. 1 American Rio Grande L. & I. Co., 400 ft. S and W of NE cor. of Lot 229, Blk. 59 (W.O.). C.O. 6,431 ft.

Union Sulphur Co.'s No. 2 American Rio Grande L. & I. Co., 400 ft. S and E lines of tract, Blk. 86, Capisallo district (W.O.). T.D. 3,044 ft.; recmtng. to sidetrack; W.O.C.

**SANDIA—JIM WELLS COUNTY**

Magnolia Pet. Co.'s No. 6 Seeligson, 660 ft. W. 330 ft. S of No. 2, Canales Sur. No. 20. S.D. 6,010 ft.; (corrected depth).

O. W. Killam's No. 7 Wade, 1,320 ft. SE of No. 4. Rigging up.

**BURNEL—KARNES COUNTY**

Luling O. & G. Co.'s No. 1 W. C. Boyce, 150 ft. from NW cor. of tract, J. Johnson Sur. Abd. 3,720 ft.

**KINGSVILLE—KLEBERG COUNTY**

Ray Clark's No. 1 House, Lot 5, Blk. 87, K.T.&I. Co. Sur. S.D. 1,000 ft.

Fidelity Exploration's No. 1 Paul O. Henry, 150 ft. from N line midway E and W lines of Blk. 2, Sec. 49, K.T.&I. Sur. Set surface csg. 304 ft.; no report.

Fidelity Exploration Synd.'s No. 1 Vivian Kivlin, Sec. 4, Blk. 39, K.T.&I. Sur. on Vivian Kivlin lease. Derrick up.

**JACOB POOL—McMULLEN COUNTY**

Inland Oil Co.'s No. 3 Lark, 150 ft. from W line, 1,285 ft. from N line, Blk. 133, Scrugham Sur. Rigging up.

Loma Oil Co.'s No. 2-W L. Jacob Corp., 330 ft. from E line, 1,320 ft. due N of No. 1-W, W. D. Benham Sur. T.D. 925 ft.; drilled in but not flowing oil yet.

M. E. Young's No. 3-A Cox, E of Frio River across line from Lark tract in M. Hely Sur. (old well). Sand 1,070 ft.; no report.

**ANGELITA—SAN PATRICIO COUNTY**

Continental and Atkins & O'Neal's No. 3 Welder, 466 ft. from S line, 150 ft. W of SE cor. of Anthony tract, J. Hart Sur. Drlg. 2,500 ft.

**SINTON—SAN PATRICIO COUNTY**

Conroe Drlg. Co.'s (Heep) No. 1-D Welder, N of Sinton. S.D. 3,770 ft.

Heep Oil Co.'s No. 1-E E. H. Welder, 455 ft. out of NE cor. of Sec. 46, Coleman Pasture. T.D. 5,670 ft.; I.P. 35 bbls. per hr.; ¼-in. choke.

Plymouth Oil Co.'s No. 2-C E. H. Welder, 2,000 ft. from N line, 650 ft. from E line, Sec. 49, Subd. No. 1 of Eliza H. Welder ranch. Cored sand with good show of oil 5,621-24 ft.; set csg.; W.O.C.

Plymouth Oil Co.'s No. 3-C E. H. Welder, 744 ft. from N line, 2,000 ft. from E line, Sec. 49, Subd. No. 1, E. H. Welder ranch. T.D. 5,501 ft.; testing after drlg. plugs.

Plymouth Oil Co.'s No. 1-D E. H. Welder, 466 ft. from N line, 466 ft. SE of Ry., Sec. 1, Subd. No. 1, E. H. Welder ranch. Drlg. 5,320 ft.

**LOS OLMOS—STARR COUNTY**

H. L. Curry's No. 2 Bass, 660 ft. from S line, 1,335 ft. from E line of 640-ac. tract, Sec. 8, Porcions 75, 76 and 77. S.D. 1,250 ft.

Ed Limberg's No. 7 Bass, 1,500 ft. from W line, 1,675 ft. from N line of Share 6, Porcion 75. S.D. 500 ft.

**PLACETAS—STARR COUNTY**

Hughston Oil Co.'s No. 1-A Gregg-Wood, S end of Por. 84; replacement well, 990 ft. S of State Highway No. 4. Drlg. 2,550 ft.

**RIO GRANDE—STARR COUNTY**

Hiram Reed's No. 1 D. & C., 480 ft. from S line, 175 ft. from E line, Blk. 6, Tract 21, Porcion 80. Drlg. 1,260 ft.

**SAXET—NUECES COUNTY**

Benedum & Trees' No. 1 Stillwell, 330 ft. from W line, 629 ft. from N line, Blk. 31 Fishing 996 ft.; (corrected).

Houston Oil Co.'s No. 4 Morgan, 660 ft. E of No. 3, Sec. 7, Range 5. Derrick.

Houston Oil Co.'s No. 4 Walton, 330 ft. NW line, 1,560 ft. NS line. Derrick.

Houston Oil Co.'s No. 3 Morgan, 990 ft. from E line of lease, 330 ft. from N line of lease, Sec. 7, Range 5. Sand 4,861-68 ft.; I.P. 475 bbls. per day; ¼-in. choke.

Magnolia Pet. Co.'s No. 2 W. W. Walton, 330 ft. from E line, 289 ft. from S line of 92.11-ac. tract, Enrique Villareal Sur. Location.

Southern Minerals' No. 1-A Rand Morgan, Roberts Sur. S.D. 5,004 ft.

**BRUNI-WEBB COUNTY**

Associated Oil Co.'s No. 5 Bruni, 2,310 ft. SW line, 330 ft. NW line of 500-ac. tract, Sur. 6-7, Arispe grant. Rigging up.

Associated Oil Co.'s No. 3 A. M. Bruni, 660 ft. N of No. 2, 330 ft. from W line, 5,000-ac. tract, Blk. 7, M. Arispe grant. Location.

Associated Oil Co.'s No. 6 Bruni, 330 ft. from SW line, 990 ft. from NW line, Arispe grant. Abd. 3,432 ft.

American Liberty Oil Co.'s No. 2-C A. M. Bruni Est., 266.81 ft. from E line, 408.15 from S line of Unit 3, Sec. 7, M. Arispe grant. Sand 3,398-3,437 ft.; reaming.

Highland Oil Co.'s No. 8 Bruni, 1,650 ft. from NW line, 330 ft. from NE line, Sur. 7. Coring 3,407 ft.; had sand 3,387-94 ft.

Highland Oil Co.'s No. 10 A. M. Bruni, 949 ft. NE of No. 3, 506 ft. SE of No. 5, 202.4-ac. tract, M. Arispe grant. Drlg. 2,900 ft.

Highland Oil Co.'s No. 12 A. M. Bruni Estate, 520 ft. E of No. 6, 330 ft. from S line of 200-ac. tract, M. Arispe grant. Location.

O. W. Killam's No. 27 Bruni, 330 ft. from NE and SE lines, Sur. 6. T.D. 3,399 ft.; trying to stop leak in csg. at 600 ft.

**LAUREL—WEBB COUNTY**

South Texas Oil Co.'s No. 1 Laurel Bros., 100 ft. from E line, 200 ft. from S line of Sec. 269, Blk. 2, C.C.S.D.&R.G.N.G. Sur. Rebuilding derrick.

**WEST COLE POOL—WEBB COUNTY**

Allison et al's No. 1 Moses Jones, 330 ft. S and E lines of NE 100 acres, Sur. 1,649. Sand with show of gas 391-95 ft.; drlg. 570 ft.

Ross Barnhart's No. 1 de la Garza, 1,500 ft. from N line, 200 ft. from E line of Sur. 262. T.D. 2,406 ft.; reaming to test.

Magnolia Pet. Co.'s No. 7 Carlos Benavides, 340 ft. due W of No. 3, 150 ft. from S line, Sec. 661, S.K.&K. Sur. Sand 2,348-57 ft.; I.P. 75 bbls. per day on pump.

Magnolia Pet. Co.'s No. 3 S. S. Benavides, 200 ft. from N and W lines of Sec. 696, B.S.&F. Sur. Location.

**NOACK—WILLIAMSON COUNTY**

Coffield & Lanning's No. 3 Heap, 200 ft. from N line, 225 ft. from W line of tract in White Sur. Location.

R. R. Ogden's No. 1 Matteck, 150 ft. N and W lines of 108.5-ac. tract in White Sur. Location.

W. L. Stephens' No. 1 J. P. Carlson, 200 ft. out of NW cor., 900 ft. SE line, 610 ft. SW line of Samuel C. Jones Sur. Drlg. 400 ft.

**BYERSVILLE—WILLIAMSON COUNTY**

Gebhardt & Stone's No. 1 Wernli, 150 ft. S and E lines of tract, P. Cartwright Sur. Chalk 960-80 ft.; Serpentine missing; abd.

H. T. McGee's No. 1 A. J. Heal, 3,100 ft. from SW line, 3,250 ft. NW line, P. Cartwright Sur. Drlg. 995 ft.

Elmer Rule et al's No. 1 Bachmeyer, Cartwright Sur., 450 ft. from NW line, 150 ft. from NE line, 70.1-ac. tract. Moving in material.

Taylor Ref. Co.'s No. 9-A Sladek, H. White Sur., 150 ft. from NE line, 1,200 ft. SE line (creek). Drlg. shale 700 ft.

**BLAS URIBE—ZAPATA COUNTY**

O. W. Killam's No. 3 Bruni, 5,897 ft. from NW line, 2,286 ft. from NE line of Borrecitio pasture, J. V. Borrego grant. Sand 348-57 ft.; S.O.; testing.

O. W. Killam's No. 10 Bruni, 450 ft. from SW line, 150 ft. from NW line of Blk. 69, Borrego grant. Sand 1,819-22 ft.; T.D. 1,833 ft.; S.D.

**ESCOBAS—ZAPATA COUNTY**

S. R. & C. Oil Corp.'s No. 15 B. F. Cuellar, 160 ft. from NW and NE lines of Blk. 11, Sur. 65. Sand 1,252-79 ft.; I.P. 50 bbls. per day on pump.

**LOPENA—ZAPATA COUNTY**

Gem Oil Co.'s No. 1 Ramirez, 330 ft. from NW and SW lines of Share 3, Porcion 18, J. C. Ramirez grant. Set csg. at 400 ft.; W.O.C.

Lawson & Leavel's No. 1 Winslow, 330 ft. NW and SW lines of Share 7, Por. 19. Moving in material.

Trowel et al's No. 1 W. Z. Guerra. Coring brittle shale 1,790 ft.; no report.

**JENNINGS—ZAPATA COUNTY**

Texas Co.'s No. 69 Jennings, 30,046 ft. from SW line, 7,147 ft. from SE line, Cerrito Blance Sur. Sand 1,205-13 ft.; I.P. 150 bbls. per day.

**MIRANDO VALLEY—ZAPATA COUNTY**

C. L. Smith's No. 1 Robert Hinnant, 330 ft. out of NW cor. Sec. 307, Blk. 21, P. M. Makeig Sur. Testing sand 1,426 ft.

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# Among Gulf Coast Drilling Contractors

Rowan Drilling Co. is preparing to spud No. 2 Houston Farm Development Co. for Amerada Petroleum Corp. at Rattlesnake Mound, near the mouth of Chocolate Bayou in Brazoria County. Same contractor has a rig running in Eunice, New Mexico, for themselves and Neville G. Penrose; one cable tool rig running in Ector County for Texas Co.; two rigs running in East Texas for Humble Oil & Refining Co.; one in East Texas for Amerada Petroleum Corp.; one in the Cayuga Field for the Tide Water and Texas Seaboard Oil Companies; one in Tomball, Harris County, for Amerada Petroleum Corp. Errol Hesser, formerly field superintendent for George Strake in the Conroe Field, has become associated with Rowan Drilling Co., and will look after the company's tools in South Texas.

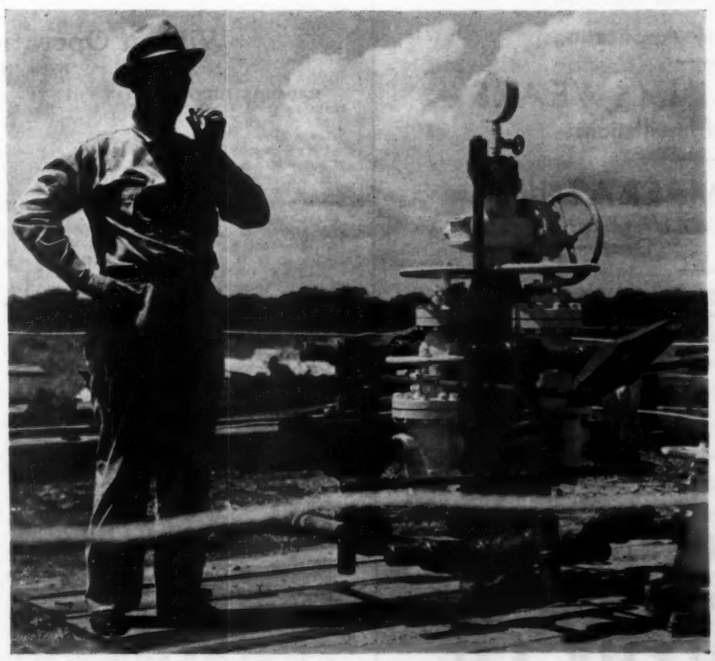
Steen Drilling Co., recently reorganized as the Halliburton Oil Producing Co., announces some changes in personnel. Phillip Shumway, formerly secretary-treasurer, has resigned to concentrate his time on personal interests, although he continues to hold his stock in the new company, and continues as secretary-treasurer of the Lavaca Gas Co., organized to distribute natural gas from the discovery well in the Port Lavaca Field, originally drilled by the Steen Drilling Co. Glenn Homan, certified public accountant of Oklahoma City, has been named to succeed Mr. Shumway as secretary of the Halliburton Oil Producing Co. L. F. Statton, for 14 years associated with the Shell Petroleum Corp. as a district superintendent in Oklahoma, Kansas, Indiana, Illinois, Kentucky, Michigan, and for the past 3½ years in charge of the company's operations at Black Bayou, Louisiana, has been named assistant to the president, Erle P. Halliburton. S. J. Ryan, land man for the Steen Drilling Co., and later with the Halliburton Oil Producing Co., has also resigned to devote his time to personal interests.

Smith & McDannald are drilling below 8,300 feet on No. 1 Katzer, for Shell Petroleum Corp., in the Roanoke Field, Louisiana; are rigging up on a new location for Pure Oil Co. at Louise, Wharton County; are drilling on No. 2 Dominguez, No. 2 Mire, No. 6 Larcade, and No. 2 LeBlanc for Superior Oil Producing Co. in the Boscoe Field, Louisiana; are finishing No. 3 Wortham for Tide Water and Texas Seaboard Oil Companies in the Cayuga Field; and are rigging up on No. 2 Kidd in the Hastings Field, Brazoria County, for Stanolind Oil & Gas Co.

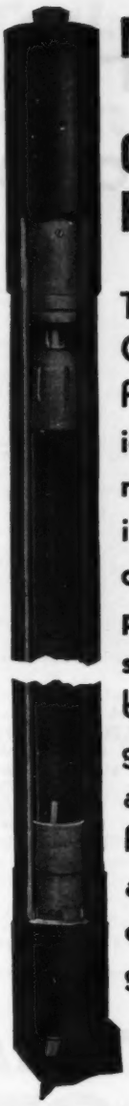
George Echols has completed a 638-bbl. well for Uscan Oil Co. in the Manvel Field, Brazoria County; is rigging up on the Mid-Tex property for the same company in the same field; is moving in to drill a 6,300-foot test for Quintana Petroleum Co. on Nash ranch in Brazoria County; is setting oil string in a well at Tomball for Shell Petroleum Corp.; is moving in to drill a well for Houston Oil Co. in East Texas; has set 5,750 feet of 7-inch pipe in a well for the Humble Oil & Refining Co. on Thompson's ranch in Bee County; is drilling below 2,300 feet on a well for Sun Oil Co. on the Brooks ranch in Jim Hogg County; has abandoned at 4,035 feet the Mantor & Briggs test for Sun Oil Co. in Starr County, where rig will be moved to new location soon to be announced; is preparing to complete a workover job for J. Simmons of Dallas in the Manvel Field, Brazoria County.

Glenn H. McCarthy, Inc., expects to be spudded in early this week on a deep test in the new Anahuac Field, Chambers County, where difficulty in rigging up has been experienced due to bad condition of roads.

Jordan Drilling Co. is feeling for the sand on No. 5 Trinity State Bank in the Kittrell Field, Houston County, for Boone Brothers.



*I. (Kid) Knowles, evening tour driller for the Steen Drilling Co., now consolidated with the Halliburton Oil Prod. Co., takes a look at Steinberger Petroleum Co's. first well in the new Port Lavaca Field, which he helped drill. Knowles also worked tour on the Halliburton Oil Producing Co's. second producer in the new field, recently completed*



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# South Houston Prospect Is Given First Setback; Favorable Showing in the Anahuac Field

By F. L. SINGLETON
Staff Correspondent, Gulf Coast Fields

HOUSTON, Tex., June 10.—The South Houston prospect of Stanolind Oil & Gas Co. was given its first setback at the close of the week when the company's No. 1 fee, located in the H.T.&B. Survey, Block 5, Harris County, tested salt water with no shows of oil or gas. Originally drilled to 5,069 feet, it was plugged back due to a crooked hole and redrilled to 5,000 feet. The test was made after an electrical coring test had been made of the hole, and 9⅝-inch casing cemented at 4,831 feet. The casing was perforated with 39 holes from 4,790-4,810 feet, and after the screen and tubing was run it was washed for several hours and started making salt water after the swab had been run six times.

While no definite decision has been announced by the operators as to what procedure will be taken next, the test will no doubt be plugged back to the next sand in the Frio below 4,745 feet, which indicated possibilities on the electrical coring device. While the above test was reported to have been in the best body of sand, a third sand in the Discorbis below 4,500 feet is said to have also shown possibilities, and will no doubt be tested provided the second test is a failure.

### Anahuac

North and slightly east of the discovery well in the Anahuac Field, northern Chambers County, some idea as to the extent of structure of the field was revealed by the favorable showing of Humble Oil & Refining Co.'s No. 3 Middleton in Section 58, H.&T.C. Survey. Based on top of the Discorbis topped at 5,821 feet and the Heterostegina at 6,195 feet, it is running more than 100 feet higher than the discovery well and is reported to have encountered more than 150 feet of saturated sand. It is coring ahead showing oil and gas below 7,100 feet. With two producers completed south and southeast of the discovery, checking lower than the discovery, it is the general opinion that the structure extends in a north and northeast direction. While this test was making a northeast extension to the field, another producer was marked up for the district by the completion of Humble Oil & Refining Co.'s No. 2 Middleton in Section 58, H.&T.C. Survey, which was completed in the Frio sand at a total depth of 7,126 feet for an initial production of 29 bbls. per hour with tubing pressure 250 pounds and casing pressure 1,500 pounds. One and a half miles northeast of the discovery well, Humble Oil & Refining Co. purchased a half interest in Rycade Oil Co.'s 240 Iola M. White lease in Section 50, H.&T.C. Survey. Although the consideration was not reported, it was said to have been a substantial cash payment, an overriding royalty interest and an interest in six free wells to be drilled on the lease.

### Port Lavaca

The northwestern limits of the Port Lavaca Field has been defined by the abandonment of Adrian Moore's No. 1 McMaster, located one-half mile northwest of the discovery, which was abandoned at 6,292 feet after testing mud and salt water on a drill stem test from 6,234-86 feet. East of the test, Texas Co.'s No. 1 R. Duelberg, 1 mile northwest of the discovery was being prepared for a production test at a plugged back depth of 6,270 feet. Seven-inch casing was cemented at 6,244 feet. Two miles west of the company's No. 1 Wehmeyer, a producer on the southwest side of the field, its No. 1 Geryk in the Y. Benavides Survey has apparently defined the structure in this direction by encountering salt water and below 6,428 feet without any shows of oil or gas being reported above that depth.

The fourth company to enter into activities of the field was made by the Empire Gas & Fuel Co., which has the derrick up for its No. 1 Dusek, located 540 feet west of the east line and 440 feet north of the south line of a 70-acre lease out of a 102.4-acre tract in the W. Benavides Survey. It is west of Texas Co.'s No. 1 Geryk, mentioned above. Since the showing made by the Texas Co.'s test it is doubtful whether this location will be drilled.

### Dickinson

In the Dickinson Field, Galveston County, Humble Oil & Refining Co. was preparing to perforate the casing for a production test on its No. 1 Fugger, located 323 feet from the west line and 522 feet from the north line of the J. S. Sherman Survey. It is bottomed in the Frio sand at 8,081 feet, with 7-inch casing cemented at 8,075 feet.

### Hastings

Two more producers loom for the Hastings Field, northeastern Brazoria County, which will bring the total number of producers to be completed to six. Stanolind Oil & Gas Co.'s No. 2 Gilbert Sneed, and east offset to the company's No. 1 Steve Paul, is bottomed in oil sand at 6,102 feet, with 7-inch casing cemented at 5,843 feet. Due north and between the company's No. 1 Surface and No. 1 Miller, its No. 2 Surface was being tested at the close of the week at a total depth of 6,100 feet. Seven-inch casing was cemented at 6,005 feet.

### Hockley

North of the Hockley Dome, in the extreme northeastern part of Harris County, Graham and Gardner's No. 1 Hager, in the J. W. Clifton Survey, which has been a location for several months, has started up and is drilling below 820 feet. Location is 150 feet out of the southeast corner of a 736-acre tract in the Clifton Survey. In the southeastern part of the county, the wildcat test of T. S. & F. Oil Co.'s No. 1 J. B. Hine, located in the A. McCormick Survey, has been abandoned after the operators plugged back from a total depth of 3,916 feet to 3,507 feet, and perforated the casing with 18 holes from 3,487-3,507 feet, which tested considerable water with a brackish taste.

### Cleveland

A production test was scheduled to be at Gulf Production Co.'s No. 9-C Kirby in the Cleveland Field, Liberty County, the first part of the week. It is bottomed at 5,852 feet, with 7-inch casing cemented at 5,842 feet. On an eight-minute drill

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## Wildcat Operations on Gulf Coast

Week Ending June 8

**RACCOON BEND—AUSTIN COUNTY**

Humble O. & R. Co.'s No. 7-X Helmuth, 2,345 ft. along NE line, 150 ft. at R/A from lease line.
Drlg. rock 975 ft.

Humble O. & R. Co.'s No. 11 Meuller, 303 ft. SE from W cor., 200 ft. from S line of lease, Wm. C. White Sur.
T.D. 4,145 ft.; I.P. 360 bbls. of fluid; 72 bbls. net oil.

Humble O. & R. Co.'s No. 8 Bellville, 190 ft. from N cor., 610 ft. E from No. 7.
T.D. 4,120 ft.; 7-in. csg. 3,992 ft.

**ALLEN DOME—BRAZORIA COUNTY**

Mills Bennett Prod. Co.'s No. 4 Rose Allen, 320 ft. SE of No. 1, 300 ft. E of No. 4 Owens, J. G. Mendal Sur.
Coring shale and lime 5,022 ft.

**DAMON MOUND—BRAZORIA COUNTY**

Intercoastal Oil Co.'s No. 13 Wisdom, 150 ft. from NW line and 10 ft. from SW line of Lot "D", Blk. No. 51.
S.D. 2,500 ft.

**HASTINGS—BRAZORIA COUNTY**

Humble O. & R. Co.'s No. 1 J. F. Bridges, center of N 10 acres of 20-ac. lease, A.C.H.&B. Sur. No. 2.
Location.

Humble O. & R. Co.'s No. 2 J. F. Bridges, center of S 10 acres of 20-ac. lease, A.C.H.&B. Sur. No. 2.
Location.

Humble O. & R. Co.'s No. 1 J. C. Johnson, center of 10-ac. lease, A.C.H.&B. Sur. No. 2.
Location.

Stanolind O. & G. Co.'s No. 1 Kidd, 285 ft. S of N line, 455 ft. E of W line of 58.4-ac. lease, A.C.H.&B. Sur. No. 2.
Rig up.

Stanolind O. & G. Co.'s No. 1 J. C. Hutchinson, 330 ft. S, 330 ft. E of the NW cor. of a 40-ac. tract in the A.C.H.&B. Sur. No. 36.
Drlg. shale 1,700 ft.

Stanolind O. & G. Co.'s No. 3 Sneed, 466 ft. at R/A from W line and 466 ft. at R/A from the N line of a 225-ac. tract, A.C.H.&B. Sur. No. 2.
Drlg. shale 2,264 ft.

Stanolind O. & G. Co.'s No. 1 B. L. Turner, 695 ft. N of S line, 2,550 ft. E of W line of survey.
Drlg. sand 4,224 ft.

Stanolind O. & G. Co.'s No. 1 Ford, 330 ft. N of S line of 199.37-ac. tract and 1,725 ft. E of W line of A.C.H.&B. Sur. No. 1.
16⅝-in. csg. 2,319 ft.

Stanolind O. & G. Co.'s No. 1 Williams, 466 ft. N, 1,126 ft. from most easterly SW cor. of 81.3-ac. lease, A.C.H.&B. Sur. No. 1.
D.S. stuck; T.D. 5,219 ft.; washing over at 2,430 ft.

Stanolind O. & G. Co.'s No. 1 Grote, 460 ft. N and W of SE cor. of 71-ac. lease, A.C.H.&B. Sur.
T.D. 5,949 ft.; to sidetrack.

Stanolind O. & G. Co.'s No. 2 Sneed, 491.5 ft. E. and 1,590 ft. S from NW cor. of Gilbert Sneed 225-ac. lease, A.C.H.&B. Sur. No. 2.
T.D. 6,102 ft.; 7-in. csg. 5,843 ft.

Stanolind O. & G. Co.'s No. 2, J. W. Surface, 375 ft. S and 466 ft. W from easterly NE cor. of 75.9-ac. lease, A.C.H.&B. Sur. No. 2.
T.D. 6,100 ft.; 7-in. csg. 6,005 ft.

**MANVEL—BRAZORIA COUNTY**

Burton Drlg. Co.'s No. 1 Beddoe, 150 ft. from S line, 290 ft. E of W line, Lot 28, H.&T.R. Sur. No. 23.
T.D. 3,986 ft.; 7-in. csg. 3,964 ft.; swbng.

T. J. Holcombe's No. 1 A. F. Beddo, 220 ft. from E line, 248 ft. from S line of Blk. 29, H.T.&B. Sur.
Location.

Jay Simmons' No. 1 Stitt, located in center of W ½ acres of Lot No. 28, H.T.&B. Sur. No. 23.
T.D. 4,008 ft.; 7-in. csg. 3,990 ft.; tested S.W.; P.B. to 3,650 ft.; prepare to sidetrack.

Texas Co.'s No. 2 Gulf Coast Home Co., 347 ft. S, 441 ft. W from NE cor. of Lot 38, H.T.&B. Sur. No. 2-B.
Rigging up.

(Continued on Page 136)

stem test from 5,832-52 feet, it showed 130 feet of oil and 50 feet of salt water. Location is in the John Pleasant Survey in the northern part of the field. Location was made last week for the company's No. 2 McDonald, and as soon as the above well is completed the rig will be moved in on the location. It is situated in the Charles Smith Survey.

**Shepherds Mott**

West of the Shepherds Mott area, in the S. R. Fensley Survey, Matagorda County, H. M. Smith's No. 1 Wadsworth was being tested at the close of the week at a total depth of 8,418 feet after 7-inch casing was cemented at 8,376 feet. On an electrical coring test made last week it showed sand with production possibilities between 8,155-67 feet, and the casing has been perforated at this depth for the production test. It topped the Discorbis 6,822-89 feet, Heterostegina at 7,200 feet, and is thought to be in the Frio horizon.

**COASTAL LOUISIANA**

Developments in Coastal Louisiana were centered on the Roanoke Field, Jefferson Davis Parish, due to the discovery of a shallower producing horizon, and the developments of two deep tests that are nearing the 10,000-foot horizon, which offered possibilities of production several weeks ago. The new sand was proven productive by the completion of Shell Petroleum Corp.'s No. 3 Kratzer, which was completed in sand from 7,584-97 feet for initial production of 1,300 bbls. per day through a 23-inch choke. The well later began to make some salt water and on the last gauge it was producing at the rate of 475 bbls. of net oil, and 49 per cent of salt water, through a 24/64-inch choke, with tubing pressure 475 pounds and casing pressure 574 pounds. Location of the well is 440 feet from the south line of the 160-acre lease. It makes the eighth producer for the field. The other wells are producing at various depths around 8,700 feet.

Shell Petroleum Corp.'s No. 1 Jarnigan, an east offset to the discovery well in Section 12-9s-4w which attracted much attention a few months ago when it encountered a sand at 10,001 feet that blew the drill stem up the hole causing it to stick, is nearing the prospective horizon again as it cores below 9,919 feet in sandy shale. After the drill stem was stuck and the operators were unable to recover it, the hole was cemented back, sidetracked and it is redrilling in a new hole. Another deep test that is causing much attention is Humble Oil & Refining Co.'s No. 2-B Devilbiss in Section 11-9s-4w, which is preparing to test at a total depth of 9,396 feet.

On the Henderson prospect in St. Martin Parish, Texas Co. has spudded in on its No. 7 St. Martin Land, and is drilling below 712 feet in shale. Location is in Section 17-8s-7e, and it is the second test to be started on the prospect within the past several months. The company's No. 1 State-Plumb Bob in Section 9 was abandoned last week at 8,204 feet.

In Iberia Parish the Little Pigeon Oil Co. has made location for a wildcat test situated 1,300 feet south and 229 feet west of the northeast corner of Section 26-12s-10e.

One new test was announced for the Gillis Field, Calcasieu Parish, by Fohs Oil Co., which has the derrick up for its No. 1 Wasey, located 275 feet each way out of the NE cor. SE SE Section 14. The company's No. 5 Castle, completed for a large gas well a few days ago, has been killed and the operators are cutting and pulling the liner to core deeper.

# Fifty-Barrel Well Starts Play in Marion Township, Henry County, Ohio

By GEORGE A. WHITNEY
Staff Correspondent, Central West Fields

FINDLAY, Ohio, June 10.—Two additional wells are being drilled in Marion Township, Henry County, where a 50-bbl. well was recently completed, one by P. D. Snonby on the Curry heirs farm, Section 6, and the other by Stoddard and Darke on the C. S. Shelly farm, Section 7, same township. Additional tests will soon start. Much leasing is under way in Henry County and adjoining counties. The oil is found in the Trenton formation.

In Hardin County, Brown and others' No. 1 on the J. E. Shoop farm, Section 26, Pleasants Township, produced 8 bbls. initial at 1,421 feet. Waltermire & Co. have a rig for No. 2 on the Anna Sharf farm, Section 18, Pleasants Township.

In Van Wert County, Duncan & Smith are drilling No. 1 C. E. Bowersox farm, Section 17, Jackson Township; Hystanton Oil & Gas Co. is drilling No. 3 on the J. A. Reed farm, Section 30, same township, and Elmer Gaudell & Co. is drilling on the Mary B. Sheetz farm, same section. Mid-Continent Oil & Gas Co. is drilling No. 2 on the Frank Brenneman farm, Section 1, Sugar Creek Township. J. O. Yahn is drilling No. 9 Anna C. Downs farm, Section 27, Liberty Township. H. C. Miller is drilling No. 1 James P. Davis farm, Section 5, Jennings Township.

In Wyandot County, Wyanco Oil & Gas Co.'s No. 5 Godlieb Sailer's farm, Section 34, Crane Township, produced 20 bbls. at 1,405 feet.

In Putnam County, Brown and others are drilling an important test on the W. E. Gairhart farm, Section 23, Blanchard Township. Same parties are drilling No. 1 on the J. E. Shoop farm, Section 26, Pleasants Township, in Hancock County.

In Seneca County, Tiffin Field, R. E. Greene is drilling No. 3 on the T. C. and B. G. Schall farm, Section 30, Liberty Township.

**CENTRAL OHIO**

Six completions were reported from the Central Ohio Field. In Perry County, Ohio Fuel Gas Co.'s No. 1 Albert Smith, Section 8, Reading Township, is a gas well at 3,095 feet. Perry Sturm and others' No. 1 on the J. T. Vansickle farm, Section 5, same township, was a gas well at 3,033 feet. Kachelmacher Oil Co.'s No. 9 on the Hemlock Coal Co.'s farm, Section 25, Coal Township, was dry. Marshall Bauman is rigging up No. 1 on the A. J. Mautz farm, Section 9, Reading Township.

In Fairfield County, City Natural Gas Works' No. 5 on the Rebecca Loose farm, Section 6, Pleasants Township, is a gas well at 2,065 feet. Same company has a rig for No. 1 on the George Messbarger farm, Section 31, same township.

In Coshocton County, Preston Oil Co.'s No. 1-1,574 on the William Frazee farm, in the Third Quarter Section, Newcastle Township, was dry at 3,220 feet. Same company's No. 4-1,580 on the C. D. Mossholder farm has a rig up, and Pure Oil Co. has a location on the Thomas J. Clark farm, Section 3, Newcastle Township. Preston Oil Co.'s No. 4-1,575 on the Robert Giffin farm, same township, produced 20 bbls. initial at 3,220 feet.

In Stark County, Lyons & Co. are drilling on the Jacob F. Hess farm, Section 2, Perry Township. Dewalt & Londen are reported drilling around 400 feet on the Charles C. Weirough farm, Section 7, Osnaburg Township. East Ohio Gas Co. is drilling below 4,235 feet in No. 2 on the George Leditherman farm, Section 11, Plain Township. Same company is drilling No. 1 J. and L. Deetz farm, Section 21, same township, below 3,650 feet, and its No. 2 on the John

(Continued on Page 119)


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**SYNTHETIC RESINS**

# Kanawha County Deep Sand Test Proves Failure; Twenty-One Completions in Eastern Fields

By STAFF CORRESPONDENT

PITTSBURGH, Pa., June 10. — Another deep sand test in West Virginia proved to be a failure. In Jefferson district, Kanawha County, Benedum & Trees are drilling through the Oriskany sand without any showing. The top of the Corniferous lime was at 4,682 feet and the tools have now passed deep enough in the Oriskany sand to condemn the well.

In Elk district, Kanawha County, the depth of the wells scheduled for the Oriskany sand are as follows: Yoak Oil & Gas Co. shut down at 4,500 feet cementing a cave on the W. T. and J. H. Goshorn farm; Benedum & Trees shut down at 4,393 feet on the Mary C. Wingfield farm for sand reel. The hole is bad. Columbian Carbon Co. is drilling at 1,275 feet on the G. and D. Copenhaver farm.

In Malden district, this company has reached 715 feet on the W. D. Lewis farm. Godfrey L. Cabot, Inc., is drilling on the Plus R. Levi farm at 1,070 feet. In Loudin district this operator is down 3,465 feet on the Edgwood Realty Co. lease.

There were 21 completions and seven dry holes in the lower eastern fields during the past week. Ten were gas wells, some fair, and 11 were producers with an initial production of 138 bbls. The largest producer and the largest gassers were in Southeast Ohio.

### SOUTHEAST OHIO

The best producer for the week was in Hocking County, Southeast Ohio. Preston Oil Co. completed No. 1,577 on the Sunday Creek Coal Co. lease, NE Section 6, Ward Township, in the Clinton sand at a depth of 3,620 feet. It is estimated good for 50 bbls. a day. The well was shot with a time shot and has yet to be cleaned out. It is about 800 feet south of No. 1,562, same farm.

In Athens County, A. D. Townsend and others completed a test on the Joseph Rainey farm near Jerseyville in Section 29, Lodi Township, in the Berea grit at a depth of 1,360 feet. It is a gas well gauging about 700,000 feet a day.

In Belmont County, John L. Gillingham completed No. 15 on the William T. Caldwell farm in the Uniontown Field in Section 32, Wheeling Township. It was drilled in the Berea sand at a depth of 1,700 feet and is producing 10 bbls. a day, natural, and has not been shot.

In Coshocton County, Preston Oil Co. completed a second test on the Robert H. Giffen farm in Newcastle Township in the Clinton sand showing for 25 bbls. a day, after shot. In the same township this company drilled a test on the William Frazee No. 3 lease through the Clinton sand and it was dry.

In Fairfield County, the city of Lancaster drilled a test on the Fred Ruff farm, SW Section 21, Rush Creek Township, through the Clinton sand to 2,680 feet. It is a gas well gauging 200,000 feet a day.

In Knox County, Upham Gas Co. completed a fair test on the J. C. Harloe farm, SW Section 10, Union Township, in the Clinton sand at a depth of 2,890 feet. It gauges about 2,000,000 feet of gas a day.

In Licking County, George H. Long's No. 3 Account completed No. 3 on the Elizabeth J. Fulton farm in Section 23, Madison Township. It was drilled in the Berea sand at 706 feet and is showing for a 1-bbl. pumper.

In Medina County, E. R. Edson & Son Co. completed No. 50 on the Edward G. Miller farm, Tract 15, Lot 12, Chatham Township, in the Berea grit at a depth of 495 feet. It produced 5 bbls. the first day after shot.

In Meigs County, Ohio Fuel Gas Co. completed a test on the S. Cross farm in Lebanon Township in the Berea sand at a total depth of 1,921 feet. It is a gas well gauging about 200,000 feet a day.

In Muskingum County, there was a fair gas well. Hopewell Fuel & Gas Co. drilled a test on the Albert Dozer farm, SE Section 9, Brush Creek Township, in the Clinton sand to 4,147 feet. It gauges about 2,800,000 feet a day.

In Perry County, Planet Oil Co. and others completed a test on the J. T. Vansickle farm, NW Section 5, Reading Township. It is a good gasser in the Clinton sand at 3,030 feet and gauges over 3,000,000 feet a day and making some oil along with the gas. The amount of oil has not been estimated as the well is shut in.

In Washington County, M. A. Martin and others completed No. 7 on the M. A. Martin sand in the eastern part of Lot 107 in Palmer Township in the Cow Run sand at 550 feet. It is a 1-bbl. pumper. In Section 33, Independence Township, and on Archers Fork, Herlan Schramm and others drilled No. 18 on the Ephraim Cummins farm through the Berea grit to 2,027 feet. It was dry.

### SOUTHWEST PENNSYLVANIA

Three wells were completed in Southwest Pennsylvania, one a small producer. In Beaver County, R. B. Abrams completed No. 5 on the Clara Walton Cook and others lease in Greene Township in the Berea sand showing for about 3 bbls. a day. In Hanover Township, George Dawson is down 1,500 feet on the Edward Groves farm and is drilling in the Berea sand.

In Washington County, George Bungard & Co. drilled deeper No. 1 on the Fred Ward lot, which had been reported as dry in the Dunkard sand, to the Gas sand, total depth 1,250 feet. The top of the sand was at 1,186 feet with about 50,000 feet of gas showing at 1,228 feet.

In Morris Township, Washington County, Carnegie Natural Gas Co. drilled No. 1 on the S. L. Harvey farm down to a total depth of 3,078 feet without additional showing and plugged back to save the Fifty-foot gas. The Pittsburgh Coal was at 808 feet and the top of the Fifty-foot sand at 2,773 feet. It will be a light gas well.

In Amwell Township, Washington County, two new locations have been made. Manufacturers Light & Heat Co. has a rig up for No. 2 on the R. A. Rankin farm. Carnegie Natural Gas Co. has made a location for No. 2 on the C. W. Dunn farm about 630 feet southwest of No. 1, which was a dry hole. No. 2 is between good gas wells on the Craft and Rankin farm and north of the gas well on the Kelso farm.

In this township the same company has started drilling deeper on the R. M. Carrons No. 2 farm after the gas in the Murphy sand blew down. The starting depth was 883 feet, at which depth there had been a showing of 1,000,000 feet a day. Raymond Orrill and others are down 1,130 feet in No. 5 on the G. L. Walker farm. The Pittsburgh Coal was at 694 feet. F. K. Fawcett and others are down 1,260 feet on the Tucker heirs farm.

In East Findley Township, Washington County, Pitroi Fuel Co. has reached 2,875 feet on the Harvey F. Taylor farm. The Natural Gas Co. of West Virginia has started drilling on the Wright Ealy farm and is down 350 feet. It is about 5,000 feet south of the Clutter oil pool.

In Cecil Township, Washington County, W. A. Lindsay has a rig completed on the S. L. Van Eman farm. In North Strabane Township, F. D. Freeland and others are drilling at 446 feet on the T. F. Clark farm. In Allegheny County, Butler County Natural Bank & Trust Co. is down 500 feet in No. 3 on the H. E. Clark farm, North Fayette Township.

In Greene County, Carnegie Natural Gas Co. is down 3,049 feet in No. 2 on the Hester Stephenson farm in Cumberland Township. The Elizabeth sand was at 3,029-41 feet with about 17,000 feet of gas showing at 3,031 feet. In Richhill Township, the test on the Samuel Chess farm is still shut down.

In Gilmore Township, Greene County, Johnson and Eddy reached 3,244 feet in the second test on the W. L. B. Roberts farm and shut down. The Bayard sand was at 3,200-04 feet with about 33,600 feet of gas showing on the top of the formation. The operators are undecided whether to retain this. In Jackson Township, H. E. Milliken and others are down 2,840 feet deepening No. 1 on the S. B. Smith farm. Myers, Hoskinson and others are rigging up to drill deeper No. 1 on the Lucinda Wright farm.

In Fayette County, William Snee and others have passed the 3,600-foot level on the Summit Hotel property in West Union Township, which is scheduled for the Devonian series.

### WEST VIRGINIA

Four producers were completed in West Virginia. The largest was the test of Glen Roberts and others on the Daniel B. Holbert farm in Burning Springs district, Wirt County, completed in the Keener sand, total depth 2,031 feet, and showing for 25 bbls. a day.

In Ritchie County, there were two small producers. In Grant district, Ralph Jackson completed a test on the S. and L. Tennant farm in the Big Injun sand at 1,655 feet showing for 5 bbls. a day along with about 26,500 feet of gas. In Murphy district about 1 mile west of Ponzo post office, Burley W. Barker completed No. 5 on the William Barker farm in the Injun sand at a depth of 1,860 feet, good for 1 bbl. a day.

In Roane County, Reedy Oil & Gas Co. completed a test on the Alfred Moore heirs farm on Peniel Run in Curtis district in the Salt sand making 12 bbls. a day. It is half a mile east of production on the Lizzie Moore heirs farm.

#### Gas Wells

In Calhoun County, Zeke Ferrell and others completed a test on the Jonathan Burrows farm in Sherman district in the Injun sand at a depth of 1,973 feet. The Big Lime was at 1,836-1,900 feet and the Big Injun sand at 1,900-64 feet with about 44,000 feet of gas, natural, showing at 1,950-63 feet. This increased with an 80-quart shot to about 500,000 feet a day.

In Ritchie County, there were several dry holes. In Clay district, H. P. McGinnis and others drilled a test on the John F. Kelly farm through the Big Injun sand to 1,780 feet. It was dry. In this district, and the Pike Pool, L. N. Rinehart and others drilled a second test on the A. J. Glass farm through the Injun sand to 1,800 feet and it was dry. In Union district, Dr. S. M. Prunty and others drilled No. 2 on the Amos Brissey (R. G. Davis and others) farm through the Gordon sand to 2,610 feet. It was also dry. On Big Run in Grant district, Big Run Oil & Gas Co. drilled No. 3 on the S. Gilmore farm through the Injun sand and it was dry.

In Roane County, Henderson Oil Co. and Guy Boggess and others completed a test on the E. S. Harnet farm in Spencer district in the Big Injun sand and it is a gas well gauging 150,000 feet a day. It is 1¼ miles north of production on the J. S. Brannon farm.

#### Drilling in West Virginia

In Cabell County, on the waters of Guyan Trace in McComas district, the Monickle Gas Co. has started drilling No. 31 on the T. C. Bledsoe farm. In this district, R. H. Adkins and others are rigging up No. 3 on the H. S. Fraley farm. Boyles and Gardner are down 2,800 feet on the Edward Owens farm. R. H. Adkins, trustee, has reached 2,500 feet on the Benjamin Bledsoe farm.

In Calhoun County, J. J. Massey is down 750 feet on the E. P. Cottrill farm in Washington district. Earl Knotts is building a rig on the H. H. Bennington farm. In Lee district, South Eastern Gas Co. is drilling at 1,650 feet on the Amos Smith farm. Everett Starcher and others are down 1,450 feet on the C. C. Starcher farm. In Sherman district, Starcher and Richards are drilling at 660 feet on the Albert Kight 52-acre farm. C. B. Lewis and others are fishing the bit at 2,016 feet on the M. J. Kight No. 2.

In Gilmer County, Hope Construction & Refining Co. has made a location on the K. C. Simmons farm in Center district about 600 feet southeast of No. 2 on the Mary A. Stump farm. In this district, Grant Fowler and others have made a location on the Nora Roberts farm, 11,000 feet northeast of production on the J. R. Simmons farm. In DeKalb district, A. E. Ellis and others have completed rig on the C. C. Pickens farm.

#### Showing of Gas

In Kanawha County, J. B. Weir is drilling in the Weir sand in the 109 on the Falling Rock Cannel Coal Co. tract in Big Sandy district. The depth is 1,725 feet and there is a strong showing of gas. In Lincoln County, Pauley & Pridemore have started drilling on the Minnie Adkins farm in Union district. H. A. Waggoner, trustee, is rigging up on the Nettie May farm in Sheridan district. Kanawha Gas & Utilities Co. is down 1,140 feet on the R. R. Sloan farm. In Logan County, Boone County Coal Co. has rigged up No. 3 on its own property.

In Hancock County, William Tope & Co. have started drilling on the Edward Chambers farm in Clay district. In Marion County, Owens Illinois Glass Co. is down 1,747 feet on the A. T. Heck farm in Paw Paw district. In Marshall County, Cameron Light & Heat Co. is drilling at 300 feet in the second test on the W. B. Hughes farm in Cameron district.

In Ritchie County, C. D. Smith and G. B. Hendershot are drilling on the R. D. Law farm on Grass Run in Murphy district. In Grant district, H. N. Rinehart is down 1,400 feet on the J. B. Markey farm. In Union district, W. A. Bickerstaff is drilling at 500 feet on the Lakin Prichard farm. In Clay district, McBurney and others have made a location on the D. L. Barker farm.

In Wirt County, W. C. Patterson has a machine on location for No. 22 on the J. S. Swisher farm in Clay district. In Wood County, Burnt Hill Oil Co. is rigged up on the Fred Delancy farm in Williams district on Plum Run. In this district, D. E. McClure is down 700 feet on the McClure farm.

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TULSA, OKLAHOMA

# Oklahoma City Area Featured by Two Wildcat Wells, One in Northern Cleveland County

By JAMES McINTYRE

Cleveland County and Oklahoma County furnished the most important wildcat strikes of the past week in Oklahoma.

Sinclair Prairie Oil Co. and Slick-Urschel, Inc.'s No. 1 Franklin, SE NW SE Section 21-10-2w, Cleveland County, 4 miles south of the Oklahoma City Field, showed a 100,000,000-foot gas production on Friday from second Wilcox sand at 7,269-91 feet. It was shut in for tanks and separator, and when this was written on Monday the well was about to be opened and given a test.

Slick-Urschel, Inc. and others' wildcat test, No. 1 Owens, SE SE SE Section 19-13-3w, a half mile northwest of Britton townsite and nearly 4 miles south of the Edmond Pool, made several flows over the derrick and was making 5,000,000 feet of gas. On Saturday it flowed 20 bbls. per hour. The gas was killed and drilling continued. Wilcox sand was found at 6,670-95 feet and the total depth was 6,720 feet, and drilling.

These operations following the success of operators in the Edmond Pool have given new life to the general Oklahoma City area and leases and royalties are commanding greatly increased prices. Slick-Urschel, Inc. will start a new wildcat in NE NE SW Section 29-13-3w, the section just southeast of No. 1 Owens. A number of leases nearby, it is said, will expire in a few months so that other tests will doubtless be started before fall.

W. A. Delaney and others' No. 1 Smith, NE SE SE Section 26-2-6, the most westerly producing well in the Fitts Pool, and which made so much oil through tubing that some other operators thought the tubing must be split, were building derrick over the well preparatory to pulling the tubing, also for the purpose of removing an obstruction in the hole.

### In the Fitts Pool

In the Fitts Pool, Pontotoc County, the following wells were put on the completed list:

Phillips Petroleum Co.'s No. 8 Norris, SW SE SW Section 25-2-6, Bromide at 4,040 feet, first sand at 4,145 feet, total depth 4,194 feet, flowed 244 bbls. the first hour and 188 bbls. the second hour, both through tubing, and gas at the rate of 2,580,000 feet per day.

E. H. Moore and others' No. 3 Akers, C NW SW NE Section 36-2-6, Bromide at 4,295 feet, sands at 4,370 and 4,447 feet, McLish at 4,490-97 feet, total depth, flowed 415 bbls. in one hour through casing.

E. H. Moore and others' No. 5 Smith B, SW NE NE Section 36-2-6, Bromide at 4,145 feet, sands at 4,245 and 4,335 feet, McLish at 4,375-80 feet, total depth, flowed 506 bbls. the first hour and 434 bbls. the second hour through casing.

E. H. Moore and others' No. 5 Craddock, NE NW SW Section 29-2-7, Wapanucka lime at 1,990 feet, total depth 2,493 feet, 10,000,000-foot gas production from Cromwell sand.

E. H. Moore and others' No. 1 Harper, SW SW NE Section 29-2-7, total depth 1,821 feet, 30,000,000-foot gas production from Atoka sand.

W. A. Delaney and others' No. 6 Harden, SE NW NW Section 30-2-7, Bromide at 4,200 feet, sands at 4,290 and 4,357 feet, total depth 4,373 feet, flowed 540 bbls. the first hour through tubing.

First reports on new work included Magnolia Petroleum Co.'s No. 5 Schaffer, SW SW NW Section 25-2-6, drilling at 110 feet; Delaney and others' No. 3 Smith, 330 feet north and 490 feet west of SE cor. Section 26-2-6, rig; Burke-Greis Oil Co.'s No. 3 Chambers, SE NE NW Section 36-2-6, location; Sinclair Prairie Oil Co.'s No. 1 Reynolds-Wagner, SW SW NW Section 17-2-7, location; E. H. Moore and others' No. 3-A Woodruff, 330 feet south and 915 feet east of C Section 29-2-7, location; Stanolind Oil & Gas Co.'s No. 4 Harden (twin), 990 feet from north and 890 feet from west lines of SW ¼ Section 30-2-7 (old 50,000,000-foot gas well at 1,468 feet, drilling deeper), drilling at 1,663 feet; E. H. Moore and others' No. 5 Patrick, NW SW NE Section 31-2-7, location; No. 6 Patrick, NE SE NW Section 31-2-7, location; No. 7 Patrick, NE SW NE Section 31-2-7, location.

Magnolia Petroleum Co.'s No. 3 Schaffer, NE SW NW Section 25-2n-6e, flowed 1,020 bbls. in two hours through casing, but had not had a tubing flow test. Bromide was found at 4,223 feet, sands at 4,319 and 4,390 feet.

Phillips Petroleum Co.'s No. 4 T. Norris, SE SE SW Section 25-2-6, which had been drilled to 4,418 feet, has been plugged back to 2,700 feet but not yet tested. Cromwell sand lies at 2,516 feet. The well showed little oil in the deep horizons.

Moore and others' No. 3 Woodruff, NE NW SE Section 29-2-7, had a 75,000,000-foot gas production at a total depth of 1,720 feet.

### Noble County

The Texas Co. and others' No. 1 Snodgrass, SE SW NE Section 7-20-2w, in the Lucien Field, Noble County, was abandoned as dry at 5,327 feet. It had first sand at 5,250-5,310 feet.

Shell Petroleum Corp.'s No. 1-A Tate, C NW NW Section 29-20-2w, was abandoned at 5,415 feet. It had Wilcox sands at 5,078 feet and 5,209 feet, with no sign of oil.

Stanolind Oil & Gas Co. and others made location for No. 3 Frederick, C SE SE Section 28-20-2w, Lucien Pool.

Magnolia Petroleum Co.'s No. 1 Sharp, C SW SW Section 34-20-2w, Lucien Pool, had first Wilcox sand at 5,034 feet and second sand at 5,130 feet, total depth 5,150 feet. The well swabbed and flowed 280 bbls. in 24 hours from the first sand, but the second was unproductive. The well will be acidized.

### Oklahoma Production

Estimated daily average production of Oklahoma for the week ending June 8 and for the preceding week follows:

| | Barrels | |
|---|---|---|
| | June 8 | June 1 |
| Allen | 8,250 | 7,800 |
| Asher-West Asher | 1,300 | 1,275 |
| Burbank | 8,650 | 8,650 |
| South Burbank | 11,000 | 11,000 |
| Balance Osage | 27,000 | 27,000 |
| Blackwell | 4,825 | 4,825 |
| Bristow-Slick | 9,100 | 9,100 |
| Chandler | 5,000 | 5,000 |
| Crescent | 5,150 | 6,175 |
| Cromwell | 4,350 | 4,350 |
| Cushing-Shamrock | 13,300 | 13,300 |
| Duncan district | 4,200 | 4,200 |
| Edmond | 2,725 | 2,200 |
| Fish | 9,550 | 10,800 |
| Fitts | 8,075 | 15,925 |
| Gray | 1,925 | 1,900 |
| Graham | 3,950 | 3,900 |
| Healdton | 9,400 | 9,250 |
| Hewitt | 4,800 | 4,750 |
| Holdenville | 1,600 | 1,525 |
| Keokuk | 1,950 | 1,050 |
| Konawa | 1,950 | 1,900 |
| Lucien | 10,675 | 12,500 |
| Marshall-Lovell | 1,000 | 1,000 |
| Oklahoma City | 143,800 | 138,950 |
| Papoose | 1,300 | 1,300 |
| Polo | 2,725 | 3,150 |
| Sasakwa and Townsite | 2,825 | 2,650 |
| Sholem Alechem | 4,000 | 4,000 |
| Seminole Field: | | |
| Bowlegs | 10,825 | 11,550 |
| Carr City | 4,425 | 6,375 |
| Earlsboro | 10,550 | 10,075 |
| East Earlsboro | 9,525 | 9,600 |
| South Earlsboro | 1,250 | 1,175 |
| Little River | 15,075 | 15,175 |
| East Little River | 825 | 800 |
| Maud | 1,200 | 1,200 |
| Mission | 3,200 | 3,150 |
| Seminole | 8,950 | 9,050 |
| East Seminole | 1,075 | 1,050 |
| Searight | 3,850 | 3,625 |
| Total Seminole | 70,750 | 72,825 |
| St. Louis-Pearson | 25,200 | 26,250 |
| Tatums | 5,100 | 5,100 |
| Tonkawa-Garber-Thomas | 6,000 | 6,000 |
| Wewoka | 3,525 | 3,500 |
| Yale-Jennings | 5,100 | 5,100 |
| Other pools | 57,625 | 56,825 |
| Total Oklahoma | 487,675 | 494,775 |

### Oklahoma County

Gulf Petroleum Co. of Oklahoma, which drilled its No. 1 Lindsay in the center of one acre, NE SW NW Section 6-13-3w, in the Edmond Pool, Oklahoma County, was given a potential test and swabbed 60 bbls. in four hours, 2 per cent salt water and 7 per cent mud, total depth 6,742 feet, completed.

Slick-Urschel, Inc., and others' No. 1 Sueneram, NE NW NE Section 6-13-3w, was completed. It flowed 1,520 bbls. in four hours from second Wilcox sand at 6,657-6,720 feet. During the first hour the accompanying gas came out at the rate of 25,000,000 feet per day, but dropped to 11,000,000 feet per day in the fourth hour.

Gypsy Oil Co.'s No. 1 Shock, NW SW SW Section 2-14-3w, a wildcat northwest of the Edmond Pool, was dry and abandoned. First Wilcox sand was found at 6,367-74 feet and second Wilcox at 6,448-56 feet. It was plugged back to 6,315 feet and three attempts were made to make a drill stem test but the packer failed to hold.

Marathon Oil Co. completed No. 1 Dahl (account 2), NE NE NW Section 31-14-3w. It flowed 756 bbls. in four hours with gas at the rate of 3,500,000 feet per day.

Slick-Urschel, Inc., made a location for No. 2 Sueneram, NW NW NE Section 6-13-3w. Marathon Oil Co. killed the gas in No. 1 Dahl, SE SE SE Section 31-14-3w, to deepen it from 6,533 feet; and in No. 3 Dahl, NW NW SE Section 31-14-3w, old total depth 6,695

## Wildcat Operations in Oklahoma

Week Ending June 8

### NORTHERN OKLAHOMA

#### BLAINE COUNTY

**Earl Ingrahm et al's No. 1 Masters, SW NW NW Sec. 27-16-11w.**
S.D. 1,240 ft.

#### CADDO COUNTY

Denver Prod. & Ref. Co.'s No. 1 Sah-Can, C SE SE Sec. 33-10-10w.
Drlg. 6,450 ft.; drill pipe stuck.
**H. W. Lee et al's No. 1 Horton, NE NE NE Sec. 9-6-13w.**
Rigged up; S.D.
**H. W. Lee et al's No. 1 Stacey Ferrell, SW NE NE Sec. 3-6-13w; (2,000-ft. test).**
T.D. 2,280 ft.; bldg. rig.

#### CANADIAN COUNTY

**R. Carl Larkin's No. 1 Brobine, NW NW NE Sec. 33-13-5w.**
Checkerboard lime 6,769 ft.; drlg. 7,004 ft.

#### CLEVELAND COUNTY

**Sinclair Prairie et al's No. 1 Franklin, SE NW SE Sec. 21-10-2w.**
Top second Wilcox 7,269 ft.; waiting for cement.

#### COAL COUNTY

Amerada Pet. Corp. and Stanolind Oil & Gas Co.'s No. 1 Travelers' Life, SW NW SE Sec. 28-1s-9e.
Bldg. rig.
Carter Oil Co. et al's No. 1 Thompson, C S½ NE NW Sec. 34-2-9.
Spudding.
**J. D. Petty Oil Co.'s No. 1 McMillan, SW NW NE Sec. 16-1s-8.**
T.D. 1,409 ft.; csg. dropped while underreaming.

#### GARVIN COUNTY

**Anderson & Kerr et al's No. 1 Rodke, NW NW SE Sec. 17-4-1w.**
Location.
**Charles Carter and W. S. Key, Inc.'s No. 1 Wood, C NW SW SE Sec. 5-4-3e.**
S.D. 2,405 ft.

#### GRANT COUNTY

**Helmerich & Payne's No. 1 Crouse, C NE SW Sec. 29-25-8w.**
Drlg. lime at 6,242 ft.

#### GREER COUNTY

**M. C. Ent and R. C. Camp's No. 1 Simington, SW SE Sec. 29-5-21w.**
T.D. 50 ft.
Gled Oil Co.'s No. 1 Leeker, SE cor. Sec. 6-4-21w.
Drlg. 1,920 ft.
**Morgan et al's No. 1 Carder, C SW SE Sec. 19-4-22w.**
Drlg. 2,805 ft.
W. Y. Rockwell et al's No. 1 Stephens, C S½ S½ SE Sec. 32-6-24w.
Machine.
D. E. Whatley et al's No. 1 Hamilton, NW SE Sec. 25-4-24w.
Cellar.

#### HARMON COUNTY

J. J. Mathis' No. 1 Keith, SE NW SW Sec. 12-5-26w.
Moving in machine.

#### HUGHES COUNTY

Caprock Oil Co.'s No. 1 Parks, SW SW SE Sec. 34-7-8.
Location.
**Dandridge & Crane's No. 1 Mead, NW NW NE Sec. 17-5-9.**
Drlg. 1,703 ft.
**Freeman et al's No. 1 Kite, NW NW NE Sec. 8-6-10.**
Top sand 700 ft.; show oil; S.D.
**Texas Co.'s No. 1 Keaton, NW SW Sec. 4-8-10.**
Viola 3,940 ft.; coring 3,983 ft.

#### KAY COUNTY

**Bay Oil Co.'s No. 1 Holden, SW SW SE Sec. 14-28-3.**
5-in. 2,945 ft.; drlg. plugs.
Lewis Prod. Co.'s No. 1 Summers, SW cor. SE NW Sec. 17-27-2.
Drlg. 815 ft.
**J. T. Lindsay's No. 1 Waggoner, NW NW NE Sec. 3-27-1.**
T.D. 835 ft.; waiting for pipe.
Marshall, Haddock et al's No. 1 Hermes, SW SW NW Sec. 6-26-4.
R.U. machine.

#### KIOWA COUNTY

**Rajah Oil Co.'s No. 3 Stone, C SE NE Sec. 34-7-17w.**
Gas 933-34 ft.; oil 944-82 ft.; may acidize; T.D. 1,004 ft.

#### LEFLORE COUNTY

McCraw et al's No. 1 Tidwell, C NW SE Sec. 17-3-22.
Rigging up machine.

#### LINCOLN COUNTY

**Carter Oil Co. et al's No. 1 McFarland C-38, SW SW NE Sec. 18-12-4.**
Wilcox sands at 5,379 ft. and 5,335 ft.; T.D. 5,345 ft.; will make Schlumberger test.
**Chester L. Carlock's No. 1 Young, C N½ NW NW Sec. 23-15-5.**
R.U. rotary.
**Mid-Continent Pet. Corp. et al's No. 1 Nunn, SE SE NW Sec. 25-15-1.**
Hunton 5,020 ft.; Sylvan 5,135 ft.; Viola 5,214 ft.; T.D. 5,224 ft.; running geophone.
Chas. Ralph's No. 1 Young, C N½ NW NW Sec. 23-15-5.
Spudded and S.D.
**Stanolind O. & G. Co. and Amerada Pet. Corp.'s No. 1 Cavanaugh, SE NE Sec. 31-15-5.**
T.D. 3,661 ft.; show of oil and 2,500 ft. of wtr. in hole; P.B. to 3,550 ft.; drilled to 3,570 ft.; will P.B.
Texas Co.'s No. 1 Niccum, SE SW NW Sec. 28-14-5.
Cored 2,760-69 ft.; lime and shale.

#### LOGAN COUNTY

**Anderson-Kerr et al's No. 1 Renfrow, NE cor. Sec. 33-16-4w.**
Dry and abd., 7,009 ft.
**Freeland et al's No. 1 Scrutchfield, NW NW NE Sec. 9-16-1e.**
Cellar.
**Houghton Royalty Co.'s No. 1 Townsite, SW SW SE Sec. 13-17-1w.**
Bldg. rig.
**Sinclair Prairie and Slick Urschel's No. 1 Koatsch, SW cor. Sec. 28-15-3w.**
Second Wilcox 6,322 ft.; T.D. 6,341 ft.; cored 6,341-43 ft.; 4,000 ft. salt water in hole; will try to cement off.
**Slick-Urschel et al's No. 1 Pennington, C SW NE Sec. 16-14-1w.**
Simpson dolomite 5,534 ft.; Wilcox 5,581 ft.; no show; lost circulation at 5,587 ft.

(Continued on Page 119)

feet, drilled 25 feet deper and the crew was preparing to test.

Phillips Petroleum Co.'s No. 1 Kennedy, 231 feet from south and 940 feet from east lines of NE ¼ Section 34-12-3w, got first Wilcox sand at 6,295-6,462 feet and 35,000,000 feet of gas, but no oil, through a 7-inch choke.

Marathon Oil Co.'s No. 5 Dahl, SW SE SE Section 31-14-3w, in the Edmond Pool, flowed 2,479 bbls. of oil in 5 hours and 20 minutes, or at the rate of about 11,150 bbls. in 24 hours, and produced gas at the rate of 10,500,000 feet. As it was still making mud at the end of the test, the potential production test was delayed.

Mid-Continent Petroleum Corp.'s No. 3 Young, SW SE NE Section 31-14-3w, in the Edmond Pool, had Wilcox sand at 6,365 feet and was drilling at 6,504 feet. Cores taken in the sand showed slight saturation.

### Logan County

Anderson & Kerr Oil Corp. and others' No. 1 Renfrow, NE NE NE Section 33-16-4w, Logan County, was dry and abandoned at 7,099 feet. Hunton lime was topped at 6,970 feet.

Carter Oil Co. and Gypsy Oil Co.'s No. 1 Walker, C NE NE Section 33-17-4w, in the Crescent Pool, which was deepened from 6,114 feet to second Wilcox sand at 6,225-45 feet (corrected depths), produced 949 bbls. in six hours and was given a potential rating of 3,799 bbls.

The Shell Petroleum Corp., which had plugged back No. 10 McCully, in Section 30-19-4w, in the Marshall Field, as reported last week, gave it another swabbing test and it yielded 108 bbls. in eight hours from Tonkawa sand. It also made 22 bbls. of water.

Helmerich & Payne and Gypsy Oil Co.'s No. 1 Moss, SE SE SW Section 11-17-1w, in the Langston Pool, which had been drilled to 5,174 feet and shot and acidized, bailed to 4,900 feet and got salt water. The hole was plugged back to 4,950 feet and the casing ripped, but the Misener sand showed nothing and the crew started to pull the pipe. Gas broke in and unloaded the hole, and the owners will test Hunton lime, which was topped at 4,927 feet.

Eason Oil Co.'s No. 1 Katscher 3, SW SE NW Section 34-17-4w, in the southern part of the Crescent Pool, had first Wilcox sand at 6,265 feet, total depth 6,280 feet. The well flowed 2,277 bbls. of oil and 4,000,000 feet of gas in 24 hours. It is not a completion.

### Northern Pontotoc County

Fleetborn Oil Corp.'s No. 1 Oliver, NE NW SE Section 21-4-5, Pontotoc County, a wildcat, was dry and abandoned at 2,229 feet. It had Bromide at 1,895 feet, sand at 2,153 feet and McLish at 2,067 feet, but no oil. It was plugged back to 1,665 feet, but the crew was unable to get a proper cement job, and no test was made of the Hunton lime.

Bray and others' wildcat test, No. 1 Stanridge, NE NW SE Section 25-5-4, had Wilcox sand at 2,804-31 feet and some salt water. It was plugged back to 2,784 feet and shot with no results, and was abandoned.

Huckleberry and others' No. 1 Miller, SW NE NW Section 27-5-6, Conservation Pool, old total depth 2,850 feet, was plugged back to 2,675 feet and acidized in Hunton lime, total depth 2,793 feet. It flowed 1,009 bbls. of oil in 24 hours and 800 bbls. the second day. The oil was cut 35 per cent with water. It was completed.

Fleetborn Oil Corp. was drilling at 535 feet in an 800-foot test, No. 2 Oliver, 280 feet south and 1,040 feet east of C Section 21-4-5.

Sonora Oil Co.'s No. 3 Gilmore, 1,250 feet south and 700 feet west of NE cor. Section 22-5-8, in the Allen Field, was cleaning out. Sand was topped at 831 feet, total depth, and 6-inch casing set at that depth.

### In the Greater Seminole

Magnolia Petroleum Co. deepened No. 1 Reed, 1,170 feet north and 150 feet west of SE cor. Section 30-7-8, Fish Pool, Seminole County. Old total depth was 3,083 feet. Wilcox sand was found at 4,181-86 feet, total depth, and the well flowed 665 bbls. in six hours. Completed.

The Texas Co.'s No. 1 Brook, SW SW NW Section 25-8-6, Bowlegs Pool, Seminole County, was plugged back from 4,151 feet to Dolomite at 4,137 feet and acidized. It pumped 17 bbls. of oil and 150 bbls. of water and was completed.

Magnolia Petroleum Co.'s No. 1 Reed, NE SW SW Section 27-8-8, in the Wewoka Field, Seminole County, was completed in Wilcox sand at 4,269-74 feet. It swabbed 150 bbls. in 12 hours and later 255 bbls. of oil in 12 hours. Put on the pump, it made 150 bbls. in 24 hours.

Phillips Petroleum Co.'s No. 1 Dobbs, C SE SE Section 18-9-5, in the Earlsboro area, Pottawatomie County, flowed 31 bbls. in 24 hours from Hunton lime at 4,123-59 feet and was completed.

Carter Oil Co. completed No. 1 George Kiker, C W half NE NW Section 11-9-6, Seminole Pool, and has a 100-bbl. well in Hunton lime at 3,978-4,030 feet. It had been acidized.

Carter Oil Co. and others' No. 4 Riddle C-28, C N half NW SE Section 35-11-6, Keokuk Pool, Seminole County, flowed 1,791 bbls. in 24 hours through tubing against a 150-pound pressure. Pay was found in Misener sand at 4,086-4,100 feet and Hunton lime at 4,100-02 feet. The well was completed.

Mid-Continent Petroleum Corp.'s No. 3 Gassoway, 330 feet from south and 890 feet from east lines of NE ¼ Section 14-6-5, Pottawatomie County, is a rig. Wood Oil Co.'s No. 1 Burton, SE NW SW Section 28-9-6, Seminole County, drilling at 580 feet. These two operations comprised all the new work reported in the immense Seminole area.

Champlin Refining Co.'s No. 8 fee, 990 feet south and 1,170 feet east of C Section 30-7-8, in the Fish Pool, had Dolomite pay at 4,110 feet and drilled to 4,125 feet. The well flowed 140 bbls. in seven hours.

Commercial Drilling Co.'s No. 1 Davis, SW SE NE Section 30-7-8, Fish Pool, had Simpson Dense at 4,052 feet and Dolomite at 4,075 feet and drilled to 4,136 feet. The well swabbed and flowed 371 bbls. in 13 hours and a week later was given another test and swabbed and flowed 1,110 bbls. in 22 hours. It was then treated with acid.

Magnolia Petroleum Co.'s No. 9 Reed, 910 feet north and 757 feet west of SE cor. Section 30-7-8, was a hole full of oil at 4,186 feet and was drilling. Viola lime was topped at 4,122 feet.

### Kay County

Argo Oil & Gas Co.'s No. 1-A Sutton, C NE SE Section 30-25-1w, Kay County, was completed. It pumped 40 bbls. of oil and 10 bbls. of water from Chat at 4,226-4,300 feet, total depth 4,324 feet.

L. H. Wentz Oil Corp.'s No. 3 Herman, NE SW NW Section 8-28-1e, was deepened from 3,335 feet to sand at 3,341 feet and pay at 3,346-56 feet, which was shot. It swabbed 30 bbls. of oil and 5 bbls. of water and was completed.

Wentz Oil Corp. has rig up for No. 2-A Mussetter, C SW SW Section 5-28-1e. Dave Morgan will deepen No. 7 Scultz, SE SE NW Section 31-29-1e, old total depth 345 feet, and has rig up.

### Osage County

Barnsdall Oil Co.'s No. 29, 810 feet north and 1,000 feet east of C Section 30-21-9, Osage County, was dry and abandoned at 1,170 feet.

Ohio Osage Oil Co.'s No. 7, 700 feet south and 1,240 feet east of NW cor. Section 34-21-9, is a 15-bbl. pumper, completed in sand at 1,119-27 feet.

Comail Oil Co.'s No. 6, 1,140 feet from south and 1,150 feet from east lines of SW ¼ Section 32-22-8, pumped 100 bbls. of oil and 20 bbls. of water and was completed in Oswego lime at 1,800-1,901 feet, total depth.

Lewis Production Co. and Texas Co.'s No. 5, SW cor. Section 9-24-7, swabbed and flowed 210 bbls. in 24 hours from Bartlesville sand at 2,642-64 feet, total depth, and was completed. It had been given a 15-quart shot at 2,653-63 feet.

Champlin Refining Co.'s No. 10, NW cor. Section 16-24-7, was completed in Bartlesville sand at 2,610-32 feet. It was given a 40-quart shot and swabbed 220 bbls. in 24 hours.

Continental Oil Co.'s No. 6, 990 feet south and 300 feet east of C Section 21-24-7, swabbed 39 bbls. from sand at 2,640-2,703 feet and was completed.

J. S. Cosden's No. 1, SE SE SW Section 34-24-8, was dry and abandoned at 730 feet.

H. F. Worley's No. 5, SE cor. SW SE SW Section 16-25-6, is a 30-bbl. pumper, completed in sand at 2,785-2,800 feet.

Barnsdall Oil Co. has spudded No. 17, 1,030 feet north and 15 feet west of C Section 30-21-9, and made a location for No. 11, 604 feet from north and 45 feet from west lines of SW ¼ Section 17-23-12. Champlin Refining Co. was building rig for No. 11, SW NW NW Section 16-24-7. Norbla Oil Corp. made a location for No. 1, 990 feet from south and 1,090 feet from west lines of SE ¼ Section 29-26-11.

In the South Burbank Field, Enterprise Transit Co.'s No. 1 Williams, 330 feet from the south and 980 feet from west lines of NW ¼ Section 35-26-6, flowed 480 bbls. in 24 hours from sand at 2,854-2,916 feet, and on the second day flowed 502 bbls. It will be shot. Same company had another good producer not yet completed in No. 2 Mosier, SE SW NE Section 34-26-6. It flowed 234 bbls. the first 24 hours from sand at 2,836-2,923 feet. It was to be shot.

### Okfuskee County

Eagle Picher Oil Co.'s No. 9 Barnett, NE NE SW Section 25-11-11, Lyons-Quinn Pool, Okfuskee County, is a 2,000,000-foot gasser in Hunton lime at 3,290 feet. It had been deepened from Dutcher sand to dry Wilcox sand and plugged back.

### Grady County

Magnolia Petroleum Co.'s No. 5 Harrison, 1,151 feet from south and 249 feet from east lines of NE ¼ Section 28-2n-5w, in the Knox Field in Grady County, an old gas well at 1,909 feet, total depth, is being cleaned out for deeper drilling.

### In the Southern Fields

Completions in the southern counties were scant in the past week.

Louis Sikes' No. 3 Dolan, 990 feet south and 1,050 feet east of NW cor. Section 15-1s-8w, Stephens County, swabbed 150 bbls. of oil and a little water from sand at 2,119-21 feet, and later flowed 150 bbls. in 24 hours through 2-inch tubing. Same owner's No. 2 Gerdies, NE cor. SW Section 21-1s-8w, is a 10,000,000-foot gasser, completed in sand at 1,963-70 feet.

Mudge Oil Co.'s No. 42 Woods, SE cor. NE NE NW Section 26-1s-5w, Stephens County, is a 6-bbl. pumper at 635-58 and 712-28 feet.

Cockburn & Boose's No. 1-A Nichols, SE cor. Section 28-2s-19w, Tillman County, was abandoned as dry at 3,022 feet. It missed all sands.

Shell Petroleum Corp.'s No. 52 Frankline, 535 feet north and 975 feet east of C Section 8-4s-3w, Healdton Pool, Carter County, pumped 49 bbls. in 24 hours from sand at 963-1,051 feet and 1,055-62 feet.

Dengail Oil & Gas Co. made a location for No. 1 Robinson, SE SE SE Section 32-1s-22w, in Jackson County. It is a 6,500-foot test, the first deep test in southwestern Oklahoma. It will be drilled not far from the Red River. Lewis Sikes had rig up for No. 1 G. L. Doherty, SE SE NW Section 21-1s-8w, in Stephens County. L. H. and J. D. Oil Co.'s No. 1 Cummings, 1,175 feet from the north and 150 feet from east lines of NW ¼ Section 27-1s-8w, is a rig; Texas Co.'s No. 7 Eams, NW SE SW Section 24-1s-3w, a rig; Shasta Oil Co.'s No. 10 Cobbs, 648 feet from south and 1,170 feet from east lines of NE ¼ Section 2-2s-10w, drilling at 1,130 feet; R. W. Vierson and others' No. 1 Williams, SW cor. SW SW NW Section 32-2s-10e, Coal County, a location; J. D. Parks' No. 1 A. M. Coats, SE NE SW Section 1-5s-8e, Bryan County, machine; Fleming & Kimball's No. 2 Snell B, SW cor. NW SW NW Section 31-7s-6e, Isom Springs Pool, Marshall County, machine rigged up; R. E. Carson's No. 1 Barber, NE NE SE Sec-

# Bureau of Mines Report on Petroleum and Petroleum Products for April

Crude petroleum: The production of crude oil in April, 1935, totaled 78,427,000 bbls., which represents a daily average of 2,614,000 bbls., compared with an average of 2,628,600 bbls. in March and with 2,526,500 bbls. for April, 1934.

The decline in crude oil production in April, 1935, is largely attributable to California; in fact, the national average would have been higher than in March if California had produced her allowable. All of the principal producing states east of California exceeded their allowables by substantial margins, although the record in this respect was better than a year ago. Due largely to a decrease in output in East Texas, the daily average production in Texas declined to 1,056,200 bbls. from an average of 1,082,300 bbls. in March. The daily average for the East Texas Field was 471,000 bbls., or 23,000 bbls. less than in March. The upward trend of production in Louisiana was continued, the daily average of 126,800 bbls. for April being the highest ever recorded except possibly during the boom days just after the war. Production was considerably higher in Oklahoma, the largest gain being in the Oklahoma City Field.

Due largely to seasonal factors, daily average crude runs to stills in April were 30,000 bbls. higher than in March. This gain in demand, combined with the decrease in production, was reflected in crude oil stocks, the net effect being that the increase in such stocks in April was much less than in March. Total stocks of refinable crude on April 30 stood at 339,793,000 bbls., compared with 339,139,000 bbls. on hand March 31, and with the almost comparable figure of 354,350,000 bbls. for April 30, 1934.

Refined products: Increased crude runs and a higher gasoline yield resulted in an increase in daily average motor fuel production in April. The indicated domestic demand for motor fuel totaled 36,076,000 bbls. or 10 per cent higher than a year ago. The domestic demand for the first four months of this year was 4 per cent above the corresponding period of 1934. The record as to exports of motor fuel was much less optimistic, the daily average in April being only 49,000 bbls., compared with an average of 84,000 bbls. in March and with 91,000 bbls. in April, 1934. The decline in motor fuel stocks, the first decline of the year, exceeded expectations, the decrease in stocks of finished and unfinished gasoline being about 1,900,000 bbls., compared with 1,520,000 bbls. as contemplated in the federal allocation.

In spite of the seasonal factor, the domestic demand for gas oil and fuel oil was well maintained, the daily average for April being 956,000 bbls., compared with 976,000 bbls. in March.

According to the Bureau of Labor Statistics, the price index for petroleum products for April, 1935, was 51, compared with 49.8 for March, 1935, and 49.4 for April, 1934.

The refinery data of this report were compiled from refineries with an aggregate daily recorded crude oil capacity of 3,667,000 bbls. These refineries operated during both March and April, 1935, at 68 per cent of their capacity.

tion 9-1n-11w, Comanche County, drilling at 305 feet; Westheimer & Daube's No. 3 Pierce, NW NW NW Section 19-2n-9w, Comanche County, a rig.

Manson Oil Co. and others' No. 1 Minor, NW NE NE Section 15-1n-20w, in the Altus Field, Jackson County, swabbed 32 bbls. in 12 hours from Granite wash at 1,414-54 feet, and the crew was preparing to run tubing.

Selby Oil & Gas Co.'s No. 1 Cobb, NE NW NE Section 22-1n-20w, Altus Field, pumped 23 bbls. of oil in three hours from Granite wash from 1,128-38 feet, total depth 1,140 feet, in shale. It had been given a 10-quart shot.

In the Seay Field in Jefferson County, Farlyn Oil Co.'s No. 31 Seay, SW cor. SE NW SE Section 3-7s-5w, tested 16 bbls. of oil and 21 bbls. of water from lime at 1,210-42 feet, which had been acidized.

Gypsy Oil Co.'s No. 1 J. J. James, a wildcat in C SW SE SE Section 30-6s-6w, on a good-looking structure, had water at 1,905-20 feet and 2,016-53 feet, and was drilling at 2,058 feet.

The Waco Turner deep test, No. 1 A. F. Munson, NE NW NE Section 35-5s-2w, Carter County, was drilling at 4,054 feet in shale. With the exception of a gas showing at 1,965-87 feet, no oil or gas showings were reported thus far.

Shasta Oil was getting ready to drill in No. 2 Cobb, 648 feet from south and 870 feet from east lines of NE ¼ Section 2-2s-10w, Walters district, Cotton County. It has sand at 2,141-42 feet, total depth, which tested 4 bbls. in four hours.

Carter Oil Co.'s Carter County deep test, No. 1 Carter-Williams, SW NE SW Section 27-2s-3w, had Viola lime at 5,740 feet and was drilling at 6,113 feet in lime.

Cox & Hamon's No. 3 fee, 1,470 feet east of C Section 17-2s-2w, Wildcat Jim Pool, Carter County, is estimated to be good for 150 bbls. per day from a sand series from 1,536 to 2,496 feet, in the course of which there are 14 sands. The well had not yet been given a real production test.

Twin State Oil Co.'s No. 1 Bridenthal, NW NE NE Section 9-1s-3w, Tussy Pool, Carter County, is estimated to be a 100-bbl. producer. It was drilled to 2,757 feet, casing run to 2,740 feet, with the last 200 feet perforated. It is not a completion.

## NO WORLD CONGRESS IN U. S.

The American Petroleum Institute has informed the Institution of Petroleum Technologists of London, England, that it cannot accept an invitation to sponsor a World Petroleum Congress in the United States in 1936. President Byles informed the Institution that the Institute regretted the necessity for declining the invitation, adding that visitors from the British group and others of a similar nature would be assured cordial welcomes at Institute meetings.

## PAN AMERICAN FOREIGN CORP.

Report of Pan American Foreign Corp. and subsidiaries (controlled by Standard Oil Co. of New Jersey) for year ended December 31, 1934, shows net income of $13,920,755 after federal taxes, depreciation, depletion, amortization, retirements, interest, minority interest, etc., equivalent to $4.07 a share (par $1) on 3,416,082 combined shares of Class A and Class B common stocks. It is stated that owing to circumstances prevailing in Mexico which were beyond the control of the company, it was possible to include the results of the Mexican operations for only 11 months.

This compares with $6,752,115 or $1.98 a share on combined Class A and Class B common stocks in 1933.

## J. H. BARR DIES

James H. Barr, formerly chairman of the National Supply Co., and at one time president of the organization, died at his home in New York City on Saturday, June 1.

## Wildcat Operations in Oklahoma

(Continued from Page 117)

Stanolind O. & G. Co. et al's No. 1 Nunn, SE NW Sec. 25-15-1.
Drlg. 2,597 ft.

**MAJOR COUNTY**

Indian Territory Illuminating Oil Co. and Continental Oil Co.'s No. 1 Fairview, C E½ SW SE Sec. 32-22-14w.
Drlg. 2,050 ft.

**NOBLE COUNTY**

Marathon Oil Co.'s No. 1 Gilbert, NE cor. Sec. 24-23-2.
Wilcox sand 4,449 ft.; T.D. 4,480 ft.; flowed 1,793 bbls. in 7 days; may deepen.

**OKFUSKEE COUNTY**

Amerada Pet. Corp.'s No. 1 Jaynes, NW NW SW Sec. 20-10-10.
Hunton 3,690 ft.; 10,000,000 ft. of gas at 3,704 ft.; Wilcox sand 3,933 ft.; T.D. 4,-025 ft.; 275 ft. wtr. in hole; P.B. to 3,-882 ft.

Olean Pet. Co.'s No. 3 Fish, SE NE NW Sec. 36-10-10 (Wilcox sand test).
Wilcox sand 3,942-61 ft.; flows oil and wtr.; will shoot.

Wilcox O. & G. Co.'s No. 1 Connelly, SE NE SE Sec. 23-14-2e.
Location.

**OKLAHOMA COUNTY**

Gypsy Oil Co.'s No. 1 Salisbury, NW NE NE Sec. 13-14-4w.
Rig up; moving in tools.

Gypsy Oil Co.'s No. 1 Shock, NW SW SW Sec. 2-14-3w.
Wilcox sand 6,367-74 ft. and 6,448-56 ft.; no showing; P.B. to 6,315 ft. but could not test; dry and abd.

Sinclair Prairie O. & G. Co.'s No. 1 Corbett, NE NW NE Sec. 17-13-3w.
Drlg. 5,900 ft.

Slick-Urschel Oil Co. et al's No. 1 Owen, SE cor. Sec. 19-13-3w.
Simpson 6,558 ft.; drlg. 6,595 ft.

**OSAGE COUNTY**

J. A. Freeberg et al's No. 1, NE cor. SE Sec. 1-25-6.
Location.

**PAWNEE COUNTY**

Stanolind O. & G. Co.'s No. 1 Shunatana, NE SW SE Sec. 32-22-3.
Rig.

Trees Oil Co.'s No. 1 Susan Wedd, C SE SE Sec. 27-24-6.
Drlg. 3,255 ft., in lime.

**PITTSBURG COUNTY**

Choctaw Gas Co.'s No. 1 Bunyard, SE SE NE Sec. 18-7-18.
Drlg. 1,305 ft.

McAllister Pet. Corp. et al's No. 1 Chunn, C SE NW Sec. 29-4-14.
T.D. 1,530 ft.; pipe collapsed; S.D.

P. H. Gray et al's No. 1 Lee, NW SE Sec. 12-5-12.
T.D. 1,210 ft.; fishing tools; S.D.

**PONTOTOC COUNTY**

E. M. Blanchard's No. 1 Crabtree, NE SE NE Sec. 27-3-6.
S.D. 2,920 ft.

Philip Boyle's No. 1 McCracken, NE NW NW Sec. 31-5-4.
T.D. 2,170 ft.; set 7-in. csg.; bailing.

Charles E. Carter's No. 1 Wood, NW SW SE Sec. 5-4-3.
S.D. 2,070 ft.

Continental Oil Co.'s No. 1 McCarty, C SW NW Sec. 12-1-7e.
Location.

Crabb-Craw Oil Co.'s No. 1-A Breco, SE NE SW Sec. 3-4-8.
Sand 1,106-18 ft.; pumped 10 bbls. in 24 hrs.; S.D.

W. A. Delaney et al's No. 1 Fulsome, SE NE Sec. 35-4-6.
Location.

Fleetborn Oil Corp.'s No. 2 Oliver (twin), 280 ft. S and 1,040 ft. E of C Sec. 21-4-5.
Drlg. 535 ft.

Fleetborn Oil Corp.'s No. 1 Oliver, NE NW SE Sec. 21-4-5.
Bromide 1,895 ft.; sand 2,158 ft.; dry; McLish 2,067 ft.; T.D. 2,229 ft.; dry and abd.

Mudge O. & G. Co.'s No. 1 Clampett, SW NW NW Sec. 10-2-6.
S.D. 915 ft.

Gillette & Kroeger's No. 1 Duver, NW SE Sec. 36-1n-6e.
S.D. 1,300 ft.

Southern Oil Co.'s No. 1 Walker, NW NW SW Sec. 11-4-6.
H.F.W. 1,410-30 ft.

Leonard Williams et al's No. 1 Breedon, NW cor. Sec. 6-2-5.
Spudded and S.D.

**PUSHMATAHA COUNTY**

Ungerman et al's No. 1 Misser, SE SW SW Sec. 35-3s-18e.
T.D. 3,196 ft.; waiting for fuel.

**SEMINOLE COUNTY**

L. Cooper's No. 1 Chandler, NE SE SW Sec. 4-5-6.
S.D. 1,780 ft.

Ray Dorris and J. T. Hall's No. 1 Dorris, SE SE SW Sec. 31-10-7.
Sand 520-60 ft.; H.F.W.; S.D. 608 ft.

Verser & Clay et al'r No. 1 Thomas, NE SE NW Sec. 1-6-6.
S.D. at 2,802 ft.

Tom Phillips et al's No. 1 Abbott, NE cor. Sec. 33-8-7.
Wapanucka 3,260 f'.; cored 3,276-88 ft.; run 10-in.

**WASHITA COUNTY**

Okla.-Midwestern Oil Co.'s No. 1 Dock, SW cor. Sec. 21-8-14w.
T.D. 2,430 ft.; lost tools in hole; rig rebuilt; S.D.

L. P. McWhirter's No. 1 fee, SW cor. Sec. 34-8n-19w.
Drlg. 420 ft.

**SOUTHERN OKLAHOMA**

**ATOKA COUNTY**

Amerada Pet. Corp., Stanolind O. & G. Co., et al's No. 1 Travelers Life Ins. Co., SW NW SE Sec. 28-1s-9e.
Location.

Clark et al's No. 1 Morrison, SE cor. Sec. 32-1-14.
S.D. 200 ft.

Claro et al's No. 1 Bass, 510 ft. N and 1,170 ft. E of C Sec. 9-1s-14e.
Fishing 1,250 ft.

Keaton et al's No. 1-A Roland, NE cor. NW NE NE Sec. 16-3s-10e.
T.D. 883 ft.

Malernee et al's No. 1 D. O. K. Land Co., C SE SE Sec. 36-2s-13.
S.D. 3,115 ft.

R. H. Pierce et al's No. 1 Aetna Life Ins. Co., NW SW NE Sec. 10-1n-13e.
Rig.

H. W. Sears et al's No. 1 Downing, SE NW Sec. 17-1s-14.
Moving in tools.

**BRYAN COUNTY**

Welch Oil Corp.'s No. 1 Collins, NE NE Sec. 19-8s-8e.
U.R. 520 ft.; T.D. 555 ft.

J. D. Parks' No. 1 Coats, SE NE SW Sec. 1-5s-8e.
Machine.

Trio Oil Co.'s No. 1 Gilbert, SW NE SW Sec. 25-8s-7.
Drlg. 605 ft.

**CARTER COUNTY**

Bland et al's No. 1 Center, NE cor. Sec. 6-4s-2e.
Rigged up.

Waco Turner's No. 1 Munson, NE NW NE Sec. 35-5s-2w.
Drlg. 4,054 ft.

Carter Oil Co.'s No. 1 Carter-Williams, SW NE SW Sec. 27-2s-3w (7,000-ft. test).
Drlg. 6,113 ft.

Paul Robb's No. 1 Burton, 660 ft. N and 185 ft. W of C Sec. 31-1s-2w.
Location.

**CHOCTAW COUNTY**

Burns et al's No. 1 Hallum, NE NW NW Sec. 4-7s-20.
Spudded and S.D.

**COMANCHE COUNTY**

H. W. Baker's No. 1 Miller, SE SW SE NE Sec. 22-2-13w.
S.D. 120 ft.

R. E. Carson's No. 1 Barber, NE NE SE Sec. 9-1n-11w.
Drlg. 305 ft.

Oscar Jones' No. 1-A Sheets, NE SW Sec. 26-3-10w.
Machine.

F. F. Stevens' No. 1 Green, SE SW Sec. 2-1-13w.
Drlg. 1,651 ft., in lime.

**JACKSON COUNTY**

Associated Oil Co.'s No. 1 Harrell, NE NE SE Sec. 13-1s-21w.
Drlg. 875 ft.; Red shale.

J. G. Buel et al's No. 1 Kizziar, SE SE NE Sec. 2-2n-22w.
Drlg. 2,204 ft.

Burke-Greis Oil Co.'s No. 1 Millbrant, SW NW SW Sec. 31-3-19w.
Granite 1,045 ft.; drlg. 1,156 ft.

Dengail Oil & Gas Co.'s No. 1 Robinson, SE SE NE Sec. 32-1s-22w.
Location.

Gypsy Oil Co.'s No. 1 Boucher, NW SW SW Sec. 32-1-19w.
U.R. 6⅝-in. csg. 2,032 ft.; drlg. 2,070 ft.

Gypsy Oil Co.'s No. 1 Stokes, SE NW SW Sec. 11-1-20w.
Lime 1,709-11 ft.; T.D. 1,722 ft.; S.D.

Loper et al's No. 1 Conrad, NE cor. Sec. 35-1s-19w.
Drlg. 1,505 ft.

Marshall & Burnham's No. 1 Hess, NE SW NE Sec. 27-1s-20w.
T.D. 1,737 ft.; S.D.

Palo Duro Oil Co.'s No. 1 Ealum, SW SW SE Sec. 16-2-21w.
Drlg. 1,120 ft.

Robberson & Suppes' No. 1 Walker, SW cor. Sec. 19-4-20w.
Drlg. 1,210 ft.

Selby O. & G. Co.'s No. 1 Mack, NW cor. NW SW Sec. 5-2n-20w.
Drlg. 1,460 ft.

Triangle Oil Co.'s No. 1 Fox, E½ W½ NW Sec. 11-3n-20w.
T.D. 600 ft.; skidded rig for new hole; drlg. 120 ft.

Whatley & Whatley's No. 1 Holt, NW SW SE Sec. 20-1n-20w.
S.D. 1,430 ft.

**JEFFERSON COUNTY**

Gypsy Oil Co.'s No. 1 James, SW SE SE Sec. 30-6s-6w.
Drlg. 2,058 ft.

Ben H. Levy et al's No. 1 Ryan, NW cor. Sec. 16-6s-6w.
Drlg. 710 ft.

**JOHNSTON COUNTY**

W. A. Delaney et al's No. 1 Diamond, NW NE SE Sec. 5-1s-8.
Drlg. 2,100 ft.

Schermerhorn Oil Co.'s No. 1 Rich, SW SE SE Sec. 25-4s-4e.
Drlg. 532 ft.

**LEFLORE COUNTY**

McCraw et al's No. 1 Tidwell, C NW SE Sec. 17-3-22.
Rig on ground.

**LOVE COUNTY**

Amerada and Stanolind's No. 1 W. & D NW SE SE Sec. 27-6s-2e.
T.D. 1,872 ft.; crooked hole; abd.

**MARSHALL COUNTY**

Jess Cook et al's No. 1 May, NE NW Sec 12-8s-5.
Drlg. 75 ft.

Paul Robb's No. 1 Vittetoe, C NE SE Sec 11-5s-4e.
Top Sylvan shale 5,405 ft.; T.D. 5,461 ft S.D.

**MURRAY COUNTY**

Equitable O. & G. Co.'s No. 1 Ferguson NE NE SW Sec. 36-1s-3.
T.D. 945 ft.; U.R. 10-in. csg.

Hornsby & Jones' No. 1 Sadler, NE NE NW Sec. 20-1-2.
Location.

**STEPHENS COUNTY**

Wm. Angle et al's No. 1 Cooper, NE NW NW Sec. 32-2-7w.
T.D. 3,406 ft.; R.U. rotary; S.D.

Geo. Pace et al's No. 1 Daily, NE NE NE Sec. 26-1n-5w.
Cored sandy shale 2,260-2,302 ft.; showed oil and water; coring 2,306 ft.

**TILLMAN COUNTY**

J. G. Buell et al's No. 1 Haught, SE NE Sec. 12-1-16w.
Drlg. 528 ft.

Cockburn & Boose's No. 1-A Nichols, SE cor. Sec. 28-2s-19w.
Dry and abd. 3,022 ft.

Rock Island Ref. Co.'s No. 1 Lynch, C SE SW Sec. 35-1s-16w.
Drlg. 530 ft.

Loper et al's No. 1 Conrad, NE cor. Sec. 35-1s-19w.
Drlg. in brown shale, 1,660 ft.

## Central West Fields

(Continued from Page 115)

Fashnecht farm, Section 8, same township, is below 4,300 feet.

In Summitt County, Pawnee Corp.'s No. 1 on the Henry Harris farm, Section 2, Talmadge Township, is drilling below 3,725 feet.

### KENTUCKY

Ten completions were reported from the Kentucky fields. Stewart & Gealey's No. 12 on the J. H. Roberts farm, in the Oak Pool, in Ohio County, produced an initial of 85 bbls. Cumberland Petroleum Co.'s No. 23 on the Rolla Richards farm, same pool, was dry and its No. 24, same farm and pool, had an initial of 53 bbls. Same company's No. 1 F. Rusher farm, same pool, was dry. Sunflower Oil Co.'s No. 6 on the Sally Jones farm, in the Oak Pool, produced 65 bbls. initial.

Kentucky Natural Gas Co.'s No. 2 on the Denton-Adamson farm, was dry in the Jett, Jones and Barlow sands. S. M. Sirman's No. 2 was dry. H. B. Bastrus found a dry hole in No. 1 on the Otis Westerfield farm, same county.

The Petroleum Co.'s No. 3 on the Bellamy heirs farm, Ohio County, produced an initial of 45 bbls., and C. C. Brener, trustee's No. 3 Coppage farm, same county, produced 30 bbls. initial.

Snowden-McSweeney Co.'s No. 1 Kate Roberts farm, in Ohio County, is dry in the Jackson sand.

In Hancock County, Joseph B. Mayer's No. 17 on the J. W. Matthews farm, produced an initial of 85 bbls. in the Jet sand, and Younkers & Easley brought in a dry hole in the Jet sand in No. 12 on the T. H. Smith farm, in the same county.

### INDIANA

In the Indiana Field some fairly nice wells were completed. In Daviess County, C. C. Talliaferro, Jr., drilled a dry hole in No. 1 on Robinson and wife's farm, NW NW Section 31, Harrison Township, as water was struck at 865 feet. Harry Hanson and others' No. 2 on the Oliver M. Smith farm, NW SW Section 4, same Township, was also dry. A. V. Burden is drilling on the James M. Jones farm, Section 31, same township. Midwest Development Corp. is drilling No. 1 on the Tillman R. McCafferty farm, SW NE Section 31, same township.

In Knox County, Mead Oil Co.'s No. 2 Starner Bond farm, Section 11, Busseron Township, produced 2,000,000 feet of gas at 622 feet. In Johnson Township, W. A. Sage found a dry hole at 2,114 feet, on the J. W. Emmison farm, in S half, Survey 11, same farm.

In Lawrence County, J. T. Imler is drilling No. 1 on the J. T. Imler farm, in Pleasant Ridge Township, and A. Law is drilling on the Law farm, in Greene Township, Greene County.

In Henry County, G. W. Sweigart's No. 3 on fee land, NE NE Section 23, Greensboro Township, is a gas well. In Pike County, A. E. Davis is drilling No. 2 on the Frank Aurand farm, Section 20, Washington Township, and in Lockhart Township. Frank Ellison is drilling No. 1 on the Leonard Oxley farm, SE NE Section 1.

In Dearborn County, Dearborn Development Corp. is drilling No. 1 on the Joseph Hornback farm, NW SE Section 11, York Township.

In Dubois County, F. L. Damron is drilling on the Joe Schroering farm, SE SE Section 26, Marion Township.

# Thirty Completions and Same Number of New Operations in Kansas Fields; Big Gassers

By JAMES McINTYRE

Thirty completions and the same number of new operations in the Kansas fields was the record of the past week. Two immense gas wells were brought in that do not figure in the completed list, these having been Slick, Pryor & Lockhart's No. 3 Orth, SW SW NE Section 27-18-10w, Rice County, good for 50,000,000 feet from Kansas City lime at 2,945 feet, and Schermerhorn Petroleum Co.'s No. 1 Schroeder, NE cor. Section 36-18-16w, Rush County, which made a 31,000,000-foot gas production from LaMotte sand at 3,577 feet. The gas was killed off with water and the crew was drilling at 3,628 feet. Vickers Petroleum Co. and others have a 9,000,000-foot gasser in Lansing lime at 2,915 feet in their No. 1 C SE NE M NW Section 16-18-9w. Another well not included in the completions was Phillips Petroleum Co.'s No. 2, NW SW SE Section 31-19-10w, which had Siliceous lime at 3,284-99 feet and pumped a potential of 1,561 bbls. in 24 hours.

### Kansas Production

Estimated daily average production of Kansas for the week ended June 8 and for the preceding week follows:

| | Barrels | |
|---|---|---|
| | June 8 | June 1 |
| Burrton | 21,100 | 26,275 |
| Ritz-Canton | 8,125 | 7,450 |
| Hollow | 3,700 | 4,100 |
| Voshell | 4,125 | 4,850 |
| Johnson | 1,340 | 1,320 |
| Nikkell | 3,650 | 4,750 |
| Sedgwick County | 8,625 | 9,950 |
| Ellsworth County | 4,500 | 5,500 |
| Barton County | 1,990 | 1,850 |
| Rice County: | | |
| Chase Pool | 16,665 | 16,200 |
| Remainder | 6,685 | 7,400 |
| Ellis County | 350 | 225 |
| Kingman County | 790 | 850 |
| Stafford County | 1,082 | 2,640 |
| Russell County | 12,370 | 12,950 |
| Greenwood County | 11,000 | 11,100 |
| Butler County | 17,850 | 17,900 |
| Other pools | 18,253 | 17,815 |
| Total | 142,100 | 153,225 |

### Potential and Actual

The Kansas Corporation Commission finds that the demand for Kansas oil in June will average 154,300 bbls. per day, and has fixed that figure as the state's allowable crude output. The allowables in some of the most important pools will be as follows: Burrton Pool, Reno County (Hunton lime wells), 20,119 bbls.; South Burrton, 4,180 bbls.; Burrton minimum wells, 43 bbls.; total Burrton Field, 24,242 bbls. Chase, Rice County, 16,170 bbls.; Eldorado, Butler County, 11,091 bbls.; Fairport, Russell County, 3,384 bbls.; Gorham, Russell County, 3,281 bbls.; Hollow, Harvey County, 3,883 bbls.; Nikkell, McPherson County, 3,205 bbls.; Robbins, Sedgwick County, 3,535 bbls.; Russell, Russell County, 4,351 bbls.; Voshell, McPherson County, 4,826 bbls.; Ritz, McPherson County, 7,430 bbls.

The potential production of the state as of May 20 was rated at 507,633 bbls. from 19,695 wells, an average of 25 bbls. per day per well. Of the total of wells, 14,258 are in the lowest of the stripper classes, with an average daily production, potential and actual, of 1.13 bbls. per day per well.

All the wells below 15 bbls. per day in potential production are allowed 100 per cent production. There are 17,592 of these, averaging in potential and actual production a shade over 2 bbls. per day per well. This leaves 2,103 bbls. with a rated potential of 468,812 bbls. per day or an average of 223 bbls. per well per day. These wells will be permitted to produce an average of a fraction under 55 bbls. per day per well.

In the prorated pools the allowable ranges from 8.25 up to 88.35 per cent of the potential. The greater the potential of the well the lower is the percentage of allowable output. For example, 15 wells capable of producing 22,875 bbls. in 24 hours are cut to 3,093 bbls. per day, or to 13.52 per cent of the potential, while 225 other wells capable of producing 19,552 bbls. in 24 hours are given an allowable of 9,021 bbls. or 46.14 per cent of their potential.

There are 123 wells in the state which, on May 20, were rated from 1,050 up to 4,150 bbls. per well potentially, or an average of 1,365 bbls. per well; 205 other wells, with a rated potential averaging 688 bbls. per well; 487 wells averaging 211 bbls. per well, and 1,288 wells averaging 44 bbls. per well. This list includes all the wells in the prorated pools.

### Russell County

Completions in Russell County in the past week included the following wells:

Central Petroleum Co.'s No. 1 Ginther, SE cor. NE NE NW Section 30-12-15w, Oswald lime pay at 3,010-22 feet, acidized, pumped a potential production of 973 bbls. of oil in 24 hours.

Tom Palmer's No. 2 Woelk, C W half W half NW Section 22-13-14w, hole full of water from Siliceous lime topped at 3,280 feet. The water broke in at 3,339-42 feet. Dry and abandoned.

Empire Oil & Refining Co.'s No. 2 Ehrlich, SE NE SE Section 28-13-14w, Siliceous lime at 3,272-79 feet, acidized, 1,460 bbls. in 24 hours, potential test.

British American Oil Co.'s No. 2 Boxberger, SE SE NE Section 33-13-14w, abandoned location.

Empire Oil & Refining Co.'s No. 1 Johnson, SE SE SE Section 2-14-15w, Oswald lime at 3,069-3,073 feet, total depth, acidized, produced 669 bbls. in 24 hours.

Aylward and others' No. 4 Mills, NW SW NE Section 4-14-15w, Oswald lime at 3,015-75 feet, total depth, acidized, 350 bbls. in 24 hours.

R. C. Tarrant's No. 1 Williamson, SE SE NW Section 9-14-14w, abandoned at spudding depth.

Skelly Oil Co.'s No. 1 Opdycke, SW cor. Section 29-14-13w, Oswald at 2,861 feet, total depth 3,135½ feet, pumped 1,094 bbls. in 18 hours and later in its potential test, 1,331 bbls. in 24 hours with 166 bbls. of water. It had not been acidized.

First reports of new work in Russell County include Stearns & Streeter's No. 1 Dreling, SW SW SW Section 8-13-15w, location; Hartman & Blair's No. 1 Mills, SE SE SW Section 27-1s-15w, cellar; Alexander & McCole's No. 1 Baier, SE SE SE Section 34-13-15w, cellar; Empire Oil & Refining Co.'s No. 4 Ehrlich, NE SE SE Section 28-13-14w, building rig; Gypsy Oil Co.'s No. 1 Ehrlich, SW SW NW Section 1-14-15w, moving in material; Gypsy Oil Co.'s No. 1 Neidenthal, NE SE SE Section 14-14-15w, building rig; Nassau Oil Corp.'s No. 1 Karst, NW SW NE Section 27-15-14w, a wildcat, moving in material.

Hartman & Blair's No. 1 Cook, NE cor. Section 26-13-15w, had 1,000 feet of oil and water in the hole from Siliceous lime at 3,327-29 feet. It had not been tested.

Buffalo Oil Co.'s No. 5 Schaffer & Anschutz, SW cor. Section 27-13-14w, had 1,600 feet of oil in the hole from Siliceous lime at 3,271-3,301 feet.

British American Oil Co.'s No. 1 Boxberger, NE cor. Section 33-13-14w, was acidized after it had pumped 578 bbls. of oil in 22 hours from pay at 3,280-90 feet, but had not been tested after the treatment.

Hartman & Blair's No. 1 Rouback B, SE NE NW Section 2-14-15w, filled 1,500 feet with oil from Oswald lime at ),076-3,108 feet.

Central Petroleum Co.'s No. 3 Benso A, SW NE SW Section 4-14-15w, swabbed 40 bbls. in 16 hours from Oswald at 3,041-69 feet and was then acidized.

Gypsy Oil Co.'s No. 2 Neidenthal, SE NE SE Section 14-14-15w, had Siliceous lime at 3,266-78½ feet and pumped 141 bbls. in 18 hours.

Skelly Oil Co.'s No. 1 Gurney, NE NE SW Section 23-14-14w, filled 1,000 feet with oil in 12 hours from Oswald lime at 2,962-3,000 feet.

### Ellsworth County

In Ellsworth County, Stanolind Oil & Gas Co. and Gypsy Oil Co.'s No. 4 Frevert, C NE Section 21-16-10w, had Siliceous lime at 3,349-55 feet, total depth, and made a potential production of 382 bbls. per day for two days. It was not acidized. The well was completed.

Atlantic Oil Producing Co.'s No. 5 Rolfs, NE NW SE Section 14-17-9w, was good for 1,069 bbls. of oil the first 24 hours from Siliceous lime at 3,186½-89½ feet. It was completed. The well had not been acidized.

C. Davis, Winkler & Koch's No. 1 Melchert, NW NE NE Section 23-17-9, produced 1,804 bbls. in 22½ hours and was completed. It produced from Siliceous lime at 3,189-93 feet, total depth 3,194 feet. It was not acidized.

New work started includes Vickers and others' No. 3 Janssen, SW NW NW Section 13-17-9w, location; Empire Oil & Refining Co.'s No. 6 Rolfs, NE NE NE Section 14-17-9w, cellar; Carter Oil Co. and others' No. 1 Soeken, NW NW SE Section 26-17-9w, location.

Bradley & Scanlon's No. 2 Nienke, NW cor. Section 13-17-9w, pumped 240 bbls. in four hours from Siliceous lime at 3,207-09 feet.

### Rice County

Phillips Petroleum Co. completed No. 5 Link, NE NW SW Section 21-19-9w, Rice County, Siliceous lime lay at 3,213-50 feet and the well produced 322 bbls. in 24 hours, after an acid treatment.

Roy Ramsey and others' No. 2 High School land, 980 feet from south line

## Wildcat Operations in Kansas

Week Ending June 8

(Descriptions are East unless marked otherwise)

**BARBER COUNTY**

**Sam Jarvis et al's No. 1 Morrisse, C SE NE Sec. 23-30-16w.**
Rig.

**Southern Drlg. Co. et al's No. 1 Davis, 330 ft. from W and 330 ft. from S lines of NE Sec. 13-34-15w.**
Drlg. 2,745 ft.

**L. H. Wentz' No. 1 Skinner, SE NW NW NE Sec. 29-31-14w.**
Drlg. 3,041 ft.

**BARTON COUNTY**

**Lario O. & G. Co. and McCoy's No. 1 Dolechek, NE NW NE Sec. 13-16-12w.**
Drlg. 1,430 ft.

**Lario O. & G. Co. et al's No. 1 Nuss, NW SW SW Sec. 11-16-14w.**
Oswald 3,155 ft.; shows of oil 3,341-88 ft.; H.F.W 3,393 ft.; S.D.

**McMorrow & Spencer's No. 1 Hagen, NE cor. Sec. 32-20-11w.**
U.R. 5-in. to 3,512 ft.

**C. L. Price et al's No. 1 Ehrlich, NW SE Sec. 10-16-12w.**
C.O. 855 ft.

**Pryor & Lockhart's No. 1 Herrington, NE NW Sec. 6-16-12w.**
Drlg. 2,040 ft.

**Suppes & Witt's No. 1 Hayes, NW cor. Sec. 7-16-15w.**
S.D. 500 ft.

**Torry-Foster et al's No. 1 Feist, NE SE Sec. 29-18-11w.**
Rigging up.

**Wolf Creek Oil Co.'s No. 1 Kraft, SW cor. Sec. 26-16-11w.**
Siliceous lime 3,370 ft.; 300 ft. of oil in hole at 3,396-97 ft.; S.W. at 3,400-02 ft.

**BUTLER COUNTY**

**Hay & Cameron's No. 1 Johnson, NW NW SE Sec. 16-26-6.**
Drlg. 2,250 ft.

**Polhamus et al's No. 2 Semisch, C 8½ NE NE Sec. 5-28-7.**
Rigging up machine.

**Sanford et al's No. 1 Cron, SE SE SE Sec. 1-28-4.**
S.D. 2,281 ft.

**Sinclair Prairie Oil Co.'s No. 1 Moore, SE SW SE Sec. 36-24-3.**
Location.

**Ward McGinnis' No. 1 Jackson, SW NE Sec. 26-25-8.**
Drlg. 1,755 ft.

**Western Kansas O. & R. Co.'s No. 1 King & Marshall, NW NW SW Sec. 11-28-6.**
Spudded and S.D.

**CHAUTAUQUA COUNTY**

**Central Oil Co.'s No. 1 Crewa, NE NE SW Sec. 8-32-12.**
Drlg. 1,600 ft.

**CLAY COUNTY**

**Seidel Bros.' No. 1 Younken, C 8½ SE NW Sec. 21-9-4.**
Mississippi 1,772-81 ft.; est. 25 bbls. oil and some wtr.; later 5 bbls. oil and 10 bbls. of wtr.; acidized; C.O.

**COWLEY COUNTY**

**Baden, Johnson Roth & Faurot's No. 1 David, NE SW Sec. 35-30-4.**
Drlg. 440 ft.

**Lloyd, Frost & Study's No. 1 Weathered, SW SE SE Sec. 28-31-3.**
Siliceous lime 3,339 ft.; T.D. 3,344 ft.; 3.-200 ft. fluid in hole, 50% wtr.

**Wakefield's No. 1 Tharp, SE SE NE Sec. 10-32-3.**
Moving in material.

Wakefield's No. 1 Tharp, SE SE NE Sec. 10-32-3.
Moving in material.

**ELK COUNTY**

**Griffin & Bell's No. 1 Silger, NE SE SE Sec. 25-30-10.**
Lime at 1,314-20 ft.; pumped 36 bbls. of oil in 24 hrs.

**Hicks et al's No. 1 Lewis, SW SE SE Sec. 35-31-10.**
Drlg. 500 ft.

Hicks et al's No. 1 Lewis, SW SE SE Sec. 35-31-10.
S.D. 1,000 ft.

**ELLIS COUNTY**

**Joe Aylward's No. 1 Dreiling, SE SE SE Sec. 3-14-16w.**
Rigged up.

**Tom Palmer and Storm King Oil Co.'s No. 1 Ruder, SE NE NW Sec. 17-15-18w.**
S.D. 1,134 ft.

**Stanolind O. & G. Co.'s No. 1 Penney-Wann, NW SW SE Sec. 12-15-20w.**
S.D. 980 ft.

**ELLSWORTH COUNTY**

**Lario O. & G. Co.'s No. 1 State, SW SW SW Sec. 29-15s-8w.**
Drlg. 3,937 ft.

**Lario O. & G. Co. et al's No. 1 Central National Bank, SE NW Sec. 33-15-8w.**
Drlg. 2,780 ft.

**Western Exploration Co.'s No. 1 Wilkins, NW SW NW Sec. 9-17-9w.**
Drlg. 2,450 ft.

**GRAHAM COUNTY**

**Helmerich & Payne et al's No. 1 Stites, C SW SW Sec. 8-10-22w.**
Rotary rig.

**GREENWOOD COUNTY**

**Foster & Schultz's No. 1 Ferguson, C 8½ NE SW Sec. 13-26-13.**
Drlg. 1,340 ft.

**HARPER COUNTY**

**Kessler, Thier et al's No. 1 Wolfje, SW SW SE Sec. 17-33-6w.**
Moving in material.

**HARVEY COUNTY**

**Cameron, Derby Oil Co. and Trees' No. 1 Brainard, SW SE NW Sec. 19-24-2.**
H.F.W. 2,890 ft.; U.R. 8-in. csg.

**Goering Bros.' No. 1 Brainard, NE SW Sec. 3-23-2w.**
Fishing 1,320 ft.

**H. H. & S. Oil Co.'s No. 1 Frizzle, NE NE SE Sec. 21-22-2w.**
Moving in material.

**Hartman & Blair et al's No. 1 Redinger, NW cor. Sec. 15-24-3w.**
Cellar.

(Continued on Next Page)

and 980 feet from west line of the NW quarter Section 32-19-9w, Chase Pool, was dry and abandoned at 3,448 feet. It had been deepened from 3,267 feet.

Garden and others' No. 1 Leonard, SW cor. Section 2-21-7w, in the Welch Pool, was good for 732 bbls. in its potential test producing from Chat at 3,375-76½ feet total depth. It was not acidized.

Shell Petroleum Corp. and others have location made for No. 5 Ploog, 440 feet south and east of C Section 33-18-9w; Sinclair Prairie Oil Co.'s No. 5 Wallace, NE SE SW Section 29-19-9w, moving in material; Lario Oil & Gas Co.'s No. 2 Foote, NW SW NE Section 7-20-9w, location; Shell Petroleum Corp.'s No. 3 McFarland, SE NE NW Section 7-20-9w, 13-inch casing set at 172 feet; waiting for cement; Sinclair Prairie Oil Co.'s No. 3 Sharp, SW NW NE Section 7-20-9w, rig.

Gypsy Oil Co.'s No. 2 Callis, 982 feet south and 330 feet east of NW cor. Section 28-19-9w, pumped 63 bbls. in three hours.

Shell Petroleum Co.'s No. 4 Tournear, NW NE SE Section 29-19-9w, swabbed 20 bbls. per hour for four hours, from Siliceous lime at 3,222-24½ feet.

Gypsy Oil Co.'s No. 11 Christopher, SE SE NE Section 6-20-9w, pumped 669 bbls. of oil in 24 hours from Siliceous lime at 3,248-54 feet.

### McPherson County

Palmer Oil Corp.'s No. 1 Swenson, NE NE SE Section 11-18-3w, in McPherson County, was a hole full of water from Viola lime at 3,645 feet, and was abandoned.

Marathon Oil Co.'s No. 2 Duerkson, SW SE NE Section 19-22-3w, deepened from 3,471 feet to Siliceous lime at 3,640-55 feet, where it got a hole full of water, was abandoned. Same company's No. 5 Duerkson, near C SW SW NE Section 19-22-3w, deepened from 3,436 feet to Siliceous lime at 3,645-55 feet, was a hole full of water and was plugged back to Chat and later abandoned.

T. C. Johnson is deepening No. 1 Good, SE SE NW Section 13-19-3w, from 3,015 feet and was drilling at 3,100 feet. Hollow, Toews & Hinkle were moving in material at No. 1 Aschman, a wildcat, NW NW SE Section 8-21-4w.

### Barton County

Gypsy Oil Co.'s No. 1 Kultgen, NE SE NW Section 16-16-12w, Barton County, was completed. It produced 561 bbls. potentially from Oswald lime at 3,065-3,353 feet. It was not acidized.

Gypsy Oil Co. had rig up for No. 1 L. A. Steckel, NE NE NE Section 1-20-11w.

### Harvey County

Tide Water Oil Co.'s No. 2 Grandon, C SE SW Section 34-23-4w, Harvey County, was acidized in Chat at 3,261-3,358 feet and produced 545 bbls. of oil and 10 bbls. of water in 24 hours. It was completed.

H. H. & S. Oil Co. was moving in material for No. 1 Frizzle, NE NE SE Section 31-23-2w, a wildcat.

Phillips Petroleum Co.'s No. 1 Ewy, NW SW NW Section 24-22-2w, which was a hole full of water from Siliceous lime at 3,545-58 feet, was plugged back to 3,135 feet but not tested.

### Reno County

L. E. Douglas' No. 1 Kerr, NE NE NE Section 26-24-8w, in the Abbyville Pool, Reno County, was abandoned at 3,630 feet. It found a showing of oil and an ocean of water at different horizons on the way down.

In the Burrton Pool, Dickey Oil & Refining Co. and Indian Territory Illuminating Oil Co.'s No. 3 J. Baughman, C NW NE Section 3-24-4w, had Chat at 3,253-65 feet which was acidized. The well made 646 bbls. in 24 hours on its completion test.

Olson Oil Co. and Shell Petroleum Corp. had cellar dug for No. 2 Nelson, NE NE NW Section 30-23-3w.

National Union Oil Co.'s No. 1 Myers, SE NE NW Section 34-23-4w, had a rainbow of oil at 3,680 feet and 1,500

(Continued on Page 136)

## Kansas Wildcats

(Continued from Preceding Page)

D. R. Lauck et al's No. 1 Bailer, SW cor. Sec. 29-24-1.
Mississippi lime 3,068 ft.; H.F.W. 3,070-90 ft.; drlg. 3,216 ft.

L. W. Prunty et al's No. 1 Davis, NE cor. Sec. 6-22-1w.
Chat 2,922 ft.; drlg. 2,928 ft.

Twin Drlg. Co. et al's (O. J. Connell), No. 1 Ruth, SW cor. Sec. 16-22-2w.
H.F.W. 3,330 ft.; U.R. 7-in. to 3,345 ft.

Winkler Koch et al's No. 1 Mueller, SE SW NW Sec. 15-23-2w.
Drlg. 1,800 ft.

**KINGMAN COUNTY**

Derby et al's No. 1 Bartholomew, SW SW NW Sec. 8-27-4w.
S.D. 30 ft.

Gypsy Oil Co.'s No. 1 Tonn, SW NW SE Sec. 16-25-4w.
Drlg. 1,280 ft.

Kingman Oil Co.'s No. 1 Wetherall, NE NE SW Sec. 20-28-10w.
Drlg. 1,991 ft.

**McPHERSON COUNTY**

Anderson & Kerr et al's No. 1 Lackey, NE SE NW Sec. 13-21-6w.
Moving in material.

Brosius et al's No. 1 Hanson, NE NE SW Sec. 15-17-2w.
T.D. 1,108 ft.; S.D.

Carey & Miller's No. 1 Husband, SE SE NW Sec. 6-19-3w.
Moving in material.

Hollow, Toews & Hinkle's No. 1 Aschman, NW NW SE Sec. 8-21-4w.
Moving in material.

Palmer Oil Corp.'s No. 1 Swenson, NE NE SW Sec. 11-18-3w.
Viola 3,642 ft.; H.F.W.; abd.

Shell Pet. Corp.'s No. 1 Wenger, NE cor. Sec. 2-20-1w.
Viola 3,356-64 ft., T.D.; swbd. 255 bbls. in 10 hrs.; 50% wtr.; acidized; potential production 100 bbls. oil, 620 bbls. of wtr.; P.B. to 3,359 ft.; pumped 80 bbl. of oil and 210 bbls. of wtr. in 7 hrs.; S.D. for pipe line.

J. M. Washabaugh et al's, No. 1-A Berg, SW SW NE Sec. 15-20-3w.
Moving in material.

**NESS COUNTY**

Phillips Pet. Co.'s No. 1 Young, C NW SW Sec. 13-18-21w.
Drlg. 4,112 ft.

**OSAGE COUNTY**

Jim Edwards' No. 1 Detrick, C NW SE Sec. 21-14-15.
Show oil and gas 783-800 ft.; T.D. 800 ft.

**RENO COUNTY**

Bradley's No. 1 Olmsted, SW SW SW Sec. 32-22-7w.
Moving in material.

Foraker et al's No. 1 Hiett, SE SW NE Sec. 34-24-4w.
T.D. 1,285 ft.; S.D.

Gypsy Oil Co.'s No. 1 Tonn, SW NW SE Sec. 16-25-4w.
C.O.; T.D. 3,581 ft.

Haynes Bros.' No. 1 Mueller, SE SE NW Sec. 30-24-4w.
S.D. 815 ft.

L. A. Mylius et al's No. 1 Sprowl, NE NW NE Sec. 1-24-5w.
Hunton 3,744 ft.; wtr. 3,747 ft.; H.F.W. 3,786 ft.

**RICE COUNTY**

Anderson & Kerr's No. 1 Wernet, NW NW NW Sec. 24-20-6w.
R.U. rotary.

Day et al's No. 1 Mason, NW NE NE Sec. 23-21-7w.
(Mystery well.)

Detrick et al's No. 1 Conner, C NE NE Sec. 28-19-7w.
Cellar.

Detrick et al's No. 1 Conner, C NE NE Sec. 28-19-7w.
Location.

Detrick et al's No. 1 Monroe, C NE NE Sec. 9-20-7w.
Location.

Fred Rust et al's No. 1 Brown, NE cor. Sec. 16-21-6w.
Rigged up.

Vickers Pet. Co. et al's No. 1 Gouldner, SE NE NW Sec. 16-18-9w.
Drlg. 3,125 ft.

**ROOKS COUNTY**

El Dorado Refining Co.'s No. 1 Marshall, C SE SE Section 8-7-17w.
Cellar.

Murfin et al's No. 1 Wasthusin, NE NE SE Sec. 19-9-16w.
Rig.

Smith & Ash's (Carman & Hershey) No. 1 Nelson, NW NW NE Sec. 27-10-16w.
S.D. 132 ft.

Trees Oil Co. and Findeiss' No. 1 Johnson, SW SW SE Sec. 26-10-19w.
Drlg. 1,262 ft.

**RUSH COUNTY**

P. Boyle et al's No. 1 Yost, C SW SW Sec. 28-17-18w.
Drlg. 3,100 ft.

Eldorado Ref. Co.'s No. 1 Stang, SE NW Sec. 36-17-17w.
U.R. 10-in. csg. to 2,815 ft.

Lario O. & G. Co. et al's No. 1 Gillig, NE SE NW Sec. 24-17-17w.
Rigging up.

Lario O. & G. Co. and Phillips Pet. Co.'s No. 1 Benbow, NW NE NE Sec. 12-17-19w.
T.D. 3,790 ft.; fishing.

Ramsey Pet. Co. et al's No. 1 Darkes, SW SW NW Sec. 5-17-20w.
Location.

Twin Drlg. Co. et al's No. 1 Appl, SW SW NE Sec. 29-17-17w.
Rigging up.

**RUSSELL COUNTY**

J. Brouk and R. D. Bailey's No. 1 Kleusner, NW SE Sec. 34-15-12w.
Drlg. 445 ft.

Buffalo Oil Co.'s No. 1 Kunz, NE NE SW Sec. 19-14-15w.
Cellar.

Hartman & Blair's No. 1 Claussen, SE NE SW Sec. 34-12-14w.
T.D. 500 ft.

Hartman & Blair's No. 1 Rexroat, NE NW NW Sec. 31-14-14w.
Spudded.

Hartman & Blair's No. 1 Mills, SE SE SW Sec. 27-1s-15w.
Cellar.

Murphin et al's No. 1 Funk, SW cor. Sec. 19-12-13w.
Fishing at 3,040 ft.

Murfin et al's No. 1 Gorham estate, NE NE SE Sec. 29-14-15w.
Cellar.

Nassau Oil Corp.'s No. 1 Karst, NW SW NE Sec. 27-15-14w.
Moving in material.

Pryor and Lockhart's No. 1 Spicer, NE SE Sec. 21-11-15w.
Rigging up.

Reserve Pet. Co.'s No. 1 Moore, NW NW SW Sec. 15-12-12w.
Rigging up.

Ryan Pet. Co.'s No. 1 Newbold, NW SE NE Sec. 25-12-15w.
Siliceous lime 3,250 ft.; 6 bbls. wtr. 3,-265-66 ft.; S.D.

Stearns & Streeter's No. 1 Dreling, SW SW SW Sec. 8-13-15w.
Location.

Vernon & Murphin's No. 1 Becker, NE cor. Sec. 32-15-13w.
S.D. 2,335 ft.

Wakefield & Armer's No. 1 Hall, NE SE SW Sec. 36-14-15w.
Ran 6-in. csg. to 2,910 ft.

A. E. Seely et al's No. 1 Herman, SE NW Sec. 27-12-15w.
S.D. 450 ft.

Winkler & Koch's No. 1 Harman, SE SE NW Sec. 27-12-15w.
Drlg. 1,610 ft.

Wolf Creek Oil Co. et al's No. 1 Penn Mutual, SW cor. Sec. 22-15-15w.
Oswald lime 3,185 ft.; U.R. 6-in csg. to 3,293 ft.

**SEDGWICK COUNTY**

Allison & Fitzwilliams et al's No. 1 Struthers, NE SW Sec. 34-28-2w.
T.D. 3,295 ft.

Magnolia Pet. Co.'s No. 1 Bartholomew, SE SE SW Sec. 30-27-4w.
Chat 3,682 ft.; 9-in. 3,692 ft.; standardizing.

**SCOTT COUNTY**

Atlantic Oil Prod. Co.'s No. 1 Mark "A," C SE SE Sec. 28-20-33w.
Mississippi lime 4,754 ft.; coring 4,826 ft.

**STAFFORD COUNTY**

C. B. Davis et al's No. 1 Riley, SE cor. Sec. 19-22-11w.
S.D. 3,332 ft.

Empire O. & R. Co.'s No. 1 Grove, NE NE NW Sec. 5-22-11w.
12-in. pipe collapsed; fishing; T.D. 1,395 ft.

Helmerich & Payne's No. 1 Geisler, NW NW SE Sec. 28-22-12w.
Drlg. 2,650 ft.

**SUMNER COUNTY**

Allison & Fitzwilliams et al's No. 1-B Hitchcock, SE NW Sec. 16-30-1w.
Drlg. 200 ft.

Kessler & Their et al's No. 1 Wolfje, SW SW NE Sec. 17-33-6w.
Rig.

D. J. Wilson et al's No. 1 Clark, 1,320 ft. from W and 25 ft. from S line of NW Sec. 15-35-1w.
S.D. 1,000 ft.

**TREGO COUNTY**

Central Commercial's No. 1 Wagg, NW NW SE Sec. 17-13-21w.
T.D. 1,600 ft.; S.D.

Hansa & Lauck and Olson Drlg. Co.'s No. 1 Lang, SE SE NW Sec. 1-14-21w.
Drlg. 1,918 ft.

Jenmar Oil Co.'s No. 1 Jones, SE cor. Sec. 20-12-23w.
Fishing at 4,387 ft.


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# Michigan Sets New High Monthly Production; Six Months Record of Million a Month

By PAUL A. ELLIOTT
Staff Correspondent, Michigan Fields

MUSKEGON, Mich., June 10.—For the fifth consecutive month, thirteen Michigan oil pools produced more than 1,000,000 bbls. during May and also set a new high monthly record for the year to date with a total of 1,250,108 bbls.

Several other records also were broken, including a new high pressure potential of 72,595 bbls. a day, a new high daily average output of 40,350 bbls. and new high total of 1,024 producing wells as of June 1.

Aggregate production for the five months also has exceeded 5,600,000 bbls., assuring a new six months' record of more than 1,000,000 bbls. a month and indicating an almost certain new annual total which may reach 13,000,000 to 14,000,000 bbls.

### Crystal Field

The new Crystal Township, Montcalm County Field, contributed materially to the marked increase in pressure production, or potential, based on the third hour flow of new Michigan wells, and also was responsible for more than four times the estimated increase in actual runs of about 500 bbls. a day. Several other major as well as minor fields show a decline for June, which Crystal, or some other new pool, will have to make up if the State's production is to maintain its present high level.

Pressure production, or potential, was rated at 72,595 bbls. a day as of June 1, or an increase of 4,588 bbls. a day over the May 1 potential of 68,007 bbls. a day, an increase caused almost entirely by the new Crystal Pool which jumped from 4,875 to 11,326 bbls. daily. Other fields showed the following change from May to June: Porter, 49,126 to 45,634 bbls.; Yost, 6,082 to 7,360; Greendale, 3,800 to 3,667; Vernon-Leaton, 2,519 to 2,880; Home-Montcalm, 218 to 201; Beaverton, 39 to 57; Ogemaw, 1,120 to 993; Saginaw-Lapeer, 115 to 120; Oceana, 78 to 54; and Muskegon, 244 to 285.

It will be noted that the only Michigan fields affected by proration are Porter, Yost and Crystal, the first being allowed to produce more than half of its potential and the other two about one-third of their pressure production under the 75-25 basis maintained for June the same as in May. Under this schedule a minimum exemption of 75 bbls. per well may be produced with 25 per cent of the potential over 75 bbls. in any single well.

### Crystal Proration

Operators in the new Crystal Pool tentatively accepted to voluntarily come under the state proration regulations at a special meeting held in the offices of the proration committee in Mount Pleasant. About 25 executives of as many operating companies and syndicates agreed to co-operate with the committee in a three-fold program as follows:

First, adoption of a spacing plan of not more than one well to 10 acres; second, priority of Porter Pool production; and third, acceptance of proration in the Crystal area.

The committee members declared adherence to the gentlemen's agreement would avert possible breaking down of the Michigan price structure because of threatened overproduction from Crystal wells. While the present market for Michigan crude has remained firm despite an output exceeding the federal allowable of 36,900 bbls. daily by about 3,500 bbls., it is admitted prospective increased potential in the new Central Michigan Field constitutes a serious threat for the near future.

From a completion standpoint the past week was one of the least important this year, for only two small oil wells, one making 100 bbls. initial and the other 10 bbls., one 3,000,000-foot gasser and five "'dusters" were added to the record.

The most important new completion was the St. Louis (Mich.) Pipe & Supply Co.'s No. 1 Rosa Osterhaut, SW NW NW Section 36-11n-5w, Ferris Township, Montcalm County, which was estimated good for 3,000,000 feet a day in the Michigan Stray sands. It is located about 2 miles northeast of the discovery oil well in the Crystal-Montcalm Pool and about 2 miles north and one location west of Taggart Brothers, Inc.'s No. 1 Fred Smith, dry hole, in Section 1, Crystal Township, the first major disappointment in the new Central Michigan Field.

The drill topped the Michigan sands at 1,029 feet and struck the gas pay at 1,032 feet. Gordon Oil Co.'s No. 1 Allen Williams, C SW SE Section 33-13n-7w, Millbrook Township, Mecosta County, which caught fire when it was brought in the week before, was extinguished and gauged for 9,125,000 feet a day, or slightly less than the original gauge of 9,500,000 feet.

Mammoth Petroleum Corp.'s No. 1 Fred J. Graham, SW SE SW Section 31-11n-4w, Sumner Township, Gratiot County, located about a mile east and a mile north of the Crystal discovery, also was a disappointment when it drilled into bottom water as a dry hole in the Dundee. Limestone was topped at 3,192 feet with a light gas show at 3,199 feet and water at 3,216 feet. It had a hole full of water and was abandoned at 3,221 feet.

### Crystal Area

Interest in the Crystal area this week was centered on several outposts and tests nearing the Dundee.

Outstanding among these was Kelly and Evens' Anasthasia Pancak well in Section 18, New Haven Township, Gratiot County, approximately a mile and one-half east and a mile south of the Leonard-Durbin discovery, which was cased at 3,171 feet and ready to drill in.

Fred Turner and others' No. 1 Jerry McConkey, located NW SE SW Section 10, Crystal Township, 3 miles west and slightly north of the Pancak on the west shore of Duck Lake, struck a good show in the upper Traverse at 2,750 feet and was nearing the casing point at below 3,000 feet. McClanahan Oil Co.'s No. 1 Akin in Section 17 of New Haven Township, also was drilling below 3,000 feet and expected to complete this week.

Two other tests also were nearing the Dundee, the one T. F. Caldwell's No. 1 Robins in Section 3, Crystal Township, and the other the Burnstein Oil & Gas Co.'s No. 1 Keel in Section 35, Ferris Township, Montcalm County. Gordon Oil Co.'s No. 1 Fred Smith, in Section 1, Crystal Township, east offset to the unsuccessful Taggart-Smith test, also was casing above the Dundee. Newark Gas & Oil Syndicate's No. 1 George Back in Section 29 of Newark Township, Gratiot County, also was drilling ahead toward the Dundee after striking a fair show of oil at 2,688 feet in the Traverse formation topped at 2,683 feet.

Other wells indicated probable important developments southwest of the four Crystal producers.

### Other Completions

The larger of the two small oil wells drilled in last week was the Pure Oil Co.'s No. 1 Ann Corning Estate, C N NW NW Section 12-13n-2w, Jasper Township, Midland County, which was rated at 100 bbls. in the Dundee as a semiwildcat between the Yost-Jasper and Porter-Midland Fields. Operators were drilling deeper in hopes of increasing the production.

The other producer, a 10-bbl. well in the Bera, was completed by the Smith Petroleum Co. in the No. 1 Alvin C. and Carrie C. Totten, SE NW SW Section 20-10n-6e, Birch Run Townships, Saginaw County. It is a west offset to the same company's Edward E. Parlberg, a similar well completed about a month ago.

### Four Dusters

Four dry holes in addition to the Mammoth-Graham also were reported in Sherman-Isabella, Mills-Ogemaw, Arthurs-Clare, and Cherry Valley Township, Lake County.

W. J. Bernier's No. 1 James Gatehouse, C SE SE Section 35-15n-6w, was dry in the Michigan Stray sand at 1,344 feet in Sherman Township, Isabella County, and was plugged and abandoned.

Jones and Durham's No. 1 Stephen Forro, SE SW NE Section 13-21n-3e, was the unsuccessful test in Mills Township, Ogemaw County, plugged and abandoned at 1,726 feet when the Berea was encountered low at 1,715 feet. It was the farthest south active test in the township, although another test in Section 31, Richland Township, about 3 miles farther southeast, is to be carried on down.

Sun Oil Co.'s No. 1 Becker, C SE SE Section 2-18n-7e, a wildcat test in Arthurs Township, Clare County, started as a result of the small discovery in Beaverton Township across the county line, also drilled into water about 56 feet in the Dundee, and probably will be abandoned. The Beaverton discovery was reported to have picked up water when drilled deeper recently, while the Sun Oil Co. is still testing a 2-bbl. show in the Mary Hines well in Section 31, Tobacco Township, Gladwin County.

Strange & Fortney's No. 1 Patterson and Day, an old well first drilled to within a short distance of the Dundee about six years ago, struck bottom water in the Dundee at about 3,150 feet and will be abandoned.

Disappointments also were indicated in two other tests, one in Winfield Township, Montcalm County, and the other in Aetna Township, Mecosta County. The former is L. G. Thompson's No. 1 J. K. Knapp, C SE NE Section 17-12n-9w, Winfield Township, which was 35 feet in the Dundee Friday without a show of gas, oil or water. It made about 8,000,000 feet of gas in the Michigan Stray sands, however, and was recognized as the discovery well of a new Mecosta County gas field. Other tests will be drilled to the shallow gas sands if the present test fails to get oil in commercial quantities in the lower formations.

# Widespread Geological Exploration Is Planned by Canadian Government

By VICTOR LAURISTON
Staff Correspondent, Canadian Fields

CHATHAM, Ontario, June 8.—The federal government has announced a program of geological exploration throughout Canada under the public works construction act which earmarked $1,000,000 for this work. Some 180 geological parties will be sent out. Of the 30 geological parties working in Ontario, several in the London district will concentrate on petroleum and natural gas. Discussing this phase W. A. Gordon, minister of mines, pointed out natural gas production in Ontario was valued at $4,500,000 a year, adding: "Any extension of petroleum production which may come about as a result of the investigation would have special importance in view of the strategic position the mineral occupies in modern affairs and of the Dominion's importation of $41,000,000 worth of its products last year."

Imperial Oil, Ltd., of Toronto has already announced for the present year a program of geological and seismographic exploration in the Canadian West, with special attention to potential oil and gas areas in Manitoba and Saskatchewan.

### Fort Norman Field

Imperial Oil, Ltd., is resuming refining operations in the Fort Norman Field. James Rowan of Calgary made an advance flight to Fort Norman to attend to preparatory work and R. W. McKinnon, Frank Willock and Lars Kvindegaarde also left for the north, traveling by plane. Mr. McKinnon has had charge of operations since the wells were reopened three or four years ago, refining being carried on during the three or four summer months. The small plant, 53 miles north of Fort Norman and close to the Arctic Circle, produces gasoline and fuel oil, with a crude capacity between 35 and 50 bbls. a day. The output is marketed entirely in the north, and chiefly in the Great Bear mining area. Additional equipment is being taken into the field to improve the quality of the product. No additional drilling is contemplated for the immediate future.

### Turner Valley Field

In Section 28-18-2w5, South Turner Valley Field, Renfrew Royalties' No. 1, Morris & Goodfellow, L8D 3, is in a hard formation on top of the Home sand around 5,200 feet. British Dominion Oil & Development Corp.'s No. 4, L8D 6, got the Home sand at 5,230 feet and picked up the Dalhousie sand at 5,450 feet with a fairly strong show of crude. Turner Valley Royalties' No. 1, L8D 13, has run casing to 3,000 feet preparatory to resuming from 3,060 feet. Publix Oil & Gas Co.'s No. 1, L8D 8, is cleaning out a bridge formed after a shot of 800 quarts. The gas flow, originally 5,000,000 feet a day, was somewhat increased.

In the far south end, Union-Freehold Oil Corp.'s No. 1, L8D 8, Section 21-18-2w5, is in the lime at 5,610 feet and waiting for drill pipe. On the east side, Nolan-Hungerford Royalties' No. 1, S half L8D 5, Section 34-18-2w5, is below 3,712 feet. Livingston Syndicate's No. 1,

(Continued on Next Page)

The Jasmid Oil Corp.'s No. 1 Coopersville State Bank, C S half Section 22-13n-10w, Aetna Township, also was reported drilled into water after a good show of gas in the Michigan Stray sands. It may be drilled to the Dundee.

### New Locations

The 15 new locations placed under permit by the state conservation commission from May 29 to June 5 are scattered all over the lower peninsula of the State in 12 townships of eight counties.

Montcalm County led the parade with four in Crystal Township, one in Ferris Township and one in Fairplains Township. The new Crystal permits include: Michigan Producers & Refiners and Alvin H. Weber, trustee's No. 1 William Strait, SE NE SW Section 3-10n-5w; Snowden & McSweeney Co.'s No. 2 Wight heirs, NE NW NE Section 10; Pure Oil Co.'s No. 1 A. Claude Mangus, NW SW SW Section 2, and J. W. Leonard, Jr., trustee's No. 2 Mrs. Ida M. Husted, SW SW SW Section 2. The Ferris Township location was made by the United Producers Oil & Royalty Co. on the Ernest and Martha Conner lease, SE SW NW Section 26-11n-5w, north of the Crystal Field. The Golden Oil Co., of Greenville, will drill its No. 1 Garfield Olsen, SE SE NW Section 14-9n-7w, in Fairplain Township, Montcalm County.

The other nine locations are in different Townships covering a wide area and including: Clarence E. Larson and George Henry Flynn's No. 1 Amo Swanson, C SW SE Section 11-13n-10w, Aetna Township, Mecosta County; Mid-State Development Co.'s No. 1 Richard W. Anderson, SE NE NE Section 20-11n-3w, in the Crystal vicinity; Black Gold Petroleum Co.'s No. 1 E. E. Rockwell and Mrs. Byron E. Ballard, SW SW SE Section 19-24-4e, Goodar Township, Ogemaw County, in the north central section of the State; Muskegon Oil Corp.'s No. 2 Arthur Fisk, NW NW NE Section 29-22n-3e, West Branch, Ogemaw; West Ashland Oil and Muskegon Development Co.'s No. 1 Herman McKinley, NW SW NW Section 8-11n-13w, Ashland Township, Newaygo County; Charles W. Teater's No. 1 Harry W. Sawyer, NW NE SW Section 5-12n-12w, Brooks Township, also Newaygo County; Durham and Jones' No. 1 Mary E. Eggleston, NW NW SW Section 9-21n-2w, Nester Township, Roscommon County; Smith Petroleum Co.'s No. 2 Alvin H. and Carrie C. Totten, NE NE SW Section 20-10n-6e, Birch Run Township, Saginaw County, and McClanahan Oil Co.'s No. 3 S. M. Densmore, NE SW NW Section 20-13n-1w, Porter Township, Midland County.

## Canadian Fields

(Continued from Preceding Page)

N half same LSD, is temporarily shut down at 3,890 feet. In the North Turner Valley Field, Model Oils' No. 3, LSD 1, Section 22-20-3w5, is rigging rotary tools for a test of the Madison lime.

### Turner Valley Production

Royalite Oil Co. delivered 33,631 bbls. in April. The Mercury-Miracle group ranked second with 14,742 bbls. and Highwood-Sarcee Oils' No. 1 third with 5,951 bbls., the largest producing well. Model Oils had 5,026 bbls. from two wells and Century Royalties' No. 1 delivered 4,952 bbls., the second largest ducer. Carleton Royalties' No. 1 produced 2,799 bbls.; Director Royalties' No. 1 gave 3,196 bbls. and Publix Oil & Gas Co.'s No. 1 yielded 235 bbls. while drilling.

Official figures show six producing wells in the Wainwright Field. In the Skiff Field, Devenish Petroleums' No. 3 delivered 470 bbls. of heavy crude.

### Alberta Border Fields

In the Cardston district, southern Alberta, Franco Oils' No. 1, LSD 6, Section 5-3-25w4, is below 2,700 feet. In the Alberta end of the Red Coulee Field, Vanalta's No. 7, LSD 3, Section 4-1-16w4, has been drilled through the cap rock into the sand at about 2,485 feet with no oil production. Six-inch casing has been run preparatory to deepening. On the Del Bonita structure, Terminal Oil Co.'s No. 1, H. Orcutt location, NE Section 18-1-21w4, has resumed from 3,370 feet.

In the Skiff Field, Devenish Petroleums' No. 3, Section 27-5-14w4, is on production, making around 15 bbls. a day. The company is arranging to set up a small refining unit to extract tractor fuel from the heavy crude.

### Tests in the Foothills

On the Highwood-Sinclair structure, south of Turner Valley, Maple Leaf Royalties' No. 1 Banner, LSD 6, Section 34-17-3w5, has built new derrick and is lowering casing to 1,425 feet. The gas flow, approximately 1,500,000 feet a day, will be utilized for drilling.

On the Watson structure, north and west of Lundbreck, Mar Jon Oil Co.'s No. 3, LSD 3, Section 4-10-2w5, is in sandy shale below 1,630 feet. On the Rickert structure west of Turner Valley, Paramount Oils' No. 1, LSD 2, Section 28-19-4w5, is lowering casing to 3,553 feet. In the Forest Reserve area west of Olds, Hunter Valley Oil Co.'s No. 1 McLaren, LSD 12, Section 13-31-10w5, is standing cemented at 4,845 feet. On the Aldersyde structure east of Turner Valley, Ranchmen's Gas & Oil Co.'s No. 1, LSD 16, Section 13-20-28w4, is deepening from 6,385 feet.

### British Columbia Operations

Considerable drilling is in progress in various areas of southern British Columbia. In the Fraser Valley, Natural Gas Development Corp.'s No. 1, Boundary Bay district, about 25 miles from Vancouver, is running 10-inch. It is being set in a hard cap rock formation at 1,700 feet.

Noble Francis Syndicate's No. 1 on the Mrs. John McGachie farm south of New Westminster, got numerous gas shows from 135 feet with a good flow at 1,120 feet but the hole was lost. Additional drilling will likely be undertaken. Delta Finance Co.'s No. 1 is below 1,700 feet with good gas shows. Van Free Oil Co.'s No. 1, near Vancouver, is rigged up. Arrangements are being made for resumption of work in the Sumas Prairie district, where gas was encountered in small quantities in shallow tests drilled some years ago by the Sumas Oil & Gas Co. and associated interests.

In the Abbotsford district, extensive acreage held by W. R. Wright and associates will likely be drilled this season by the Alberta-B.C. Oil Co. J. T. Wilson, formerly of Calgary, has organized the Delhi Oil & Gas Co. and has camp buildings and derrick on acreage in the Coquitlam-Pitt River area.

In the Yale district, Clara M. Glover and Winifred A. Ney of Vancouver are applying for a provincial license to prospect for coal and petroleum in the Kamloops division of Yale district.

In the Sage Creek district, southeastern British Columbia, Columbia Oils' No. 1 is in a hard formation below 3,358 feet after getting a fair show of 39.2 Baume crude.

### Drilling in Ontario

In the Dover Field, Kent County, Ontario, an important new test has been started by F. H. Stover, George Rawlings and associates of Chatham on the Charles Peltier farm, NW cor. Stirling side road and Front Concession, Dover East Township. Location is fully a mile east and a little south of F. H. Stover & Son's No. 3, farthest east producer in the Dover Field. It has a small fishing job at 160 feet.

Farther west, Central Pipe Line Co.'s No. 1, Joseph Antaya farm, Lot 1, Concession 4, Dover East, has finished at 3,309 feet, approximately 400 feet in the Trenton lime. It got past the "break" in the Trenton and has about 500,000 feet a day natural flow. It will be shot.

On Duck Island in Georgian Bay, south of the west end of Manitoulin Island, Chandler Walker and associates of Walkerville are drilling a wildcat. It is down about 225 feet and running casing.

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# NATURAL GAS DEVELOPMENTS

## Supreme Court Decision on Pipe Line in Roads

Pipe line companies are interested in the decision handed down by the U. S. Supreme Court in the Naxworthy vs. Illinois Pipe Line case, which stated that pipe line companies should pay property owners adjacent to the rural highways when pipe line is laid in the roads. Two Okemah, Okla., attorneys were responsible for originally bringing up the question before the District Court at Okemah. Since then, an appeal from Lincoln County was won by these lawyers in the Supreme Court. It was stated by the defense that the use of pipe lines is a means of transportation the same as the use of trucks on the roads, but this theory was knocked down by the high court when it decided that the laying of pipe in the road constituted an additional servitude on the soil for which the adjacent landowner is entitled to compensation.

## Southern Utah Gas Field May Supply Pacific Coast

The development of a large gas field in southern Utah which may be linked with the markets of the Pacific Coast, Boulder Dam and the alunite fields of Marysvale, may result, an A.G.A. bulletin says, from the discovery of a flow of 21,000,000 feet of wet gas on the Last Chance structure in Emery County, Utah, by Ramsey Petroleum and American Oil Co., according to J. W. Weightman, vice president of the company. The gas flow was struck at a depth of 2,773 feet last summer, and after drilling further in search for oil the well was finally capped as a gasser. The well produced 4,000,000 feet of wet gas at 2,595 feet, and 21,000,000 feet at 2,773 feet. The results so far have been very good and due to the size of the structure and volume of gas it has developed into a prolific gas field in the upper sands so far penetrated. As this structure is only 600 miles from the Pacific Coast, where known gas reserves are limited and where enormous quantities of natural gas are used, it is anticipated that a line will eventually connect this field with other towns in Utah, Las Vegas, Boulder Dam and Los Angeles, Calif.

### NEW SUPPLY FOR CHEYENNE

Progress is reported in a movement in Wyoming to furnish gas for Cheyenne from the newly discovered fields at Allen Lake and Medicine Bow in southern Wyoming. Before the gas could be piped from this field, however, it would be necessary for the Ohio Oil Co., or one of its subsidiaries, either to purchase the distributing system at Cheyenne from the company now furnishing the city with gas, or to make some arrangement with the Colorado-Wyoming Gas Co. to supply its line from Denver to Cheyenne with gas. The Allen Lake and Medicine Bow Fields are already connected with Laramie, so it would only be necessary to lay a line from Laramie to Cheyenne.

### GEORGE B. CORTELYOU RESIGNS

NEW YORK, June 10.—Consolidated Gas Co. of New York will lose its executive head of the past 26 years on July 1, when George B. Cortelyou, president, will resign under a plan for the retirement of all employes and officers of the system at the age of 70, just adopted by the board of trustees. He will be succeeded by Frank W. Smith. O. H. Fogg was chosen as executive vice president. Previously Mr. Fogg had been vice president.

## New York and Pennsylvania Gas Fields; Potter County Completion Is Feature

COUDERSPORT, Pa., June 10.—Completion of the Sylvania Natural Gas Corp.'s No. 1 Z. L. James for 25,000,000 feet in Allegany Township, Potter County, featured Pennsylvania deep sand gas operations in the week ending June 7. The top of the gas pay was reached at 5,266 feet and the well was finished at 5,268 feet with the gas pressure gauged at 1,900 pounds. There were no completions in the adjacent New York fields.

#### Pennsylvania Operations

East Penn Development Co. is drilling at 2,990 feet on the Clarence Cooley farm, Lawrence Township, Tioga County, and is down at 270 feet on the Ray French farm, Clymer Township. J. B. Reed is shut down on the George Page farm, Allegany Township, Potter County. P. H. Fitzstevens is shut down at 4,350 feet on the M. Fitzstevens farm, Genesee Township. Updegraph is drilling at 3,360 feet on the Theodore Cobb farm, same township. Cowanesque Gas Co. is drilling at 3,005 feet on the E. A. Furman farm, Allegany Township. Hanley and Bird are spudding on the George Burd farm, same township. Williamsport Natural Gas Co.'s No. 1 Hill-Ellis-Cobb, Genesee Township, is drilling at 720 feet.

Sylvania Natural Gas Corp. is drilling at 1,330 feet on the Merle A. Hill farm, Genesee Township, Potter County. Penn United is drilling at 3,180 feet on the Charles Morris farm, same township. Stocum and others are drilling at 185 feet on the L. Thompson farm, same township. Sylvania is down 1,030 feet at its No. 3 Z. L. James, Allegany Township. Wyoga Natural Gas Co. is drilling at 270 feet on its No. 3 Tassel, Hebron Township. Godfrey L. Cabot is building a rig on the A. G. Lyman farm, Ulysses Township, and is moving in on the Robert R. Lewis farm, Allegany Township. United Producers is moving in on the Katherine Currier farm, same township. Penn-York is moving in on the William Cobb farm, same township. Potter Development Co. is moving in on the F. Robbins farm, Bingham Township. The deep test being drilled by William Snee on Summit Hotel property in South Union Township, Fayette County, is shut down at 3,433 feet.

#### New York Operations

Nine wells are drilling and three shut down in the New York gas field. Trumbull and others are shut down at 1,000 feet on the W. B. Lasher farm, Throop Township, Cayuga County. Southwestern Development Co. is drilling at 186 feet on the T. Moran farm, Alma Township, Allegany County. Godfrey L. Cabot is drilling at 150 feet on the B. Barringer farm, Belfast Township. Cunningham Natural Gas Co. is drilling at 510 feet on the Colligan farm, Alma Township. Wyoming Natural Gas Co. is shut down at 1,783 feet on the C. H. Caulling farm, York Township, Livingston County.

Godfrey L. Cabot is drilling at 1,408 feet on the Roberts farm, after striking gas show at 1,302 feet in York Township, Oneida County. The Oneida County, York Township, area is active at this time. Godfrey L. Cabot is also drilling at 870 feet on the Comins farm there, and Benholm Trust has staked location on the H. Vandewaker farm in same township. Rome Syndicate is shut down at 500 feet on the Meaker farm in York Township.

Property Shares, Inc., is drilling at 1,235 feet on the E. Williams farm, Florence Township, Oneida County. Wittmer Oil & Gas Co. is drilling at 1,710 feet on the Bert Bonnett farm, Howard Township, Steuben County. Belmont Quadrangle Development Co. is spudding on the Van Copen and Whiteman property, Willing Township, Allegany County. Godfrey L. Cabot is drilling at 60 feet on the Hannifan farm, Camden Township, Oneida County.

## Lone Star Is Conducting Experiment in Storage

FORT WORTH, Tex., June 10.—The Lone Star Gas Co. is conducting an experimental natural gas storage test in the old Chaney gas field, about 8 miles southeast of Ranger, Eastland County. Approximately 750,000 feet of gas is being boosted into eight intake wells originally completed in the 3,100-foot sand, using the facilities of its Chaney station compressors with gas taken from the two trunk lines served by this station. Rock pressure of the field had declined to about 150 pounds, and about 300 pounds pressure is used in pumping gas into the sand.

### OWEN SOUND GAS PROJECT

OWEN SOUND, Ontario, June 8.—The Nottawa Oil & Gas Co., Ltd., of Toronto, has submitted a proposal to supply natural gas from acreage in Grey and Bruce Counties to the Owen Sound Public Utilities Commission, which is to handle the local distribution. The company has two producing wells, one near Hepworth and another at Shallow Lake, with aggregate open flow of 109,000 feet a day; and has additional wells drilling. It also plans to recondition two wells, drilled at Hepworth 22 years ago, and which till recently supplied gas to that community. A tentative rate of 75 cents per 1,000 feet has been suggested.

### NATURAL GAS IN POLAND

The production of natural gas in Poland amounted to 462,210,028 cubic meters (1 cubic meter equals 35.314 cubic feet) in 1933, and 468,952,401 cubic meters in 1934. This gas was partly consumed in the mines and partly in towns connected with the gas district by a system of pipe lines. The production of gasoline from natural gas which is done by absorption on activated charcoal amounted in 1934 to 40,525 tons.

### TOLEDO MAY OPERATE PLANT

TOLEDO, Ohio, June 10.—The city council appointed a special committee to investigate the feasibility of condemning and taking over the property of the Northwestern Ohio Natural Gas Co., a subsidiary of the Columbia Gas & Electric Co., and operating it.

### ACME GAS ELECTION

TORONTO, Ontario, June 8.—Shareholders of the Acme Gas & Oil Co. at their annual meeting here re-elected the former board of directors, with W. R. P. Parker as president.

## Toledo Reduction Plea Brings Reverse Report

TOLEDO, Ohio, June 10.—City council's fight for lower gas rates received a severe setback when engineers of the Ohio Public Utilities Commission submitted a report showing the cost of service entitles both the natural and artificial gas companies to even higher rates than they are now collecting. The companies are the Northwestern Ohio Natural Gas Co. and the Ohio Fuel Gas Co., both subsidiaries of Columbia Gas & Electric Co.

The engineers reported the cost of services warranted a natural gas rate of 70 cents per 1,000 feet compared with 63 cents now collected, while the artificial gas rate should be $1.17 compared with 70 cents now collected.

The report is expected to end the efforts of hundreds of other Ohio communities seeking lower rates.

## Detroit Starting Survey on City's Fuel Markets

MUSKEGON, Mich., June 10.—Nine large industrial concerns in the metropolitan district of Detroit, Mich., are ready to purchase a total of 35,000,000 feet of natural gas daily, it was reported to city officials recently by M. J. Dewey, consulting gas engineer.

Mr. Dewey, a Columbus, Ohio, engineer, has been engaged by the city to make a complete fuel survey in connection with Detroit's plans to bring natural gas from the Texas Panhandle, or other large fields. About 1,300 industrial concerns in the Detroit area will be contacted during the survey.

Both Mr. Dewey and Frank P. Fisher, the city's gas consultant, are skeptical of the possibilities of Michigan fields producing sufficient natural gas to meet the needs of the Detroit area, believing they must depend upon Texas, Kentucky or other fields.

### WYOMING GAS TO NEBRASKA

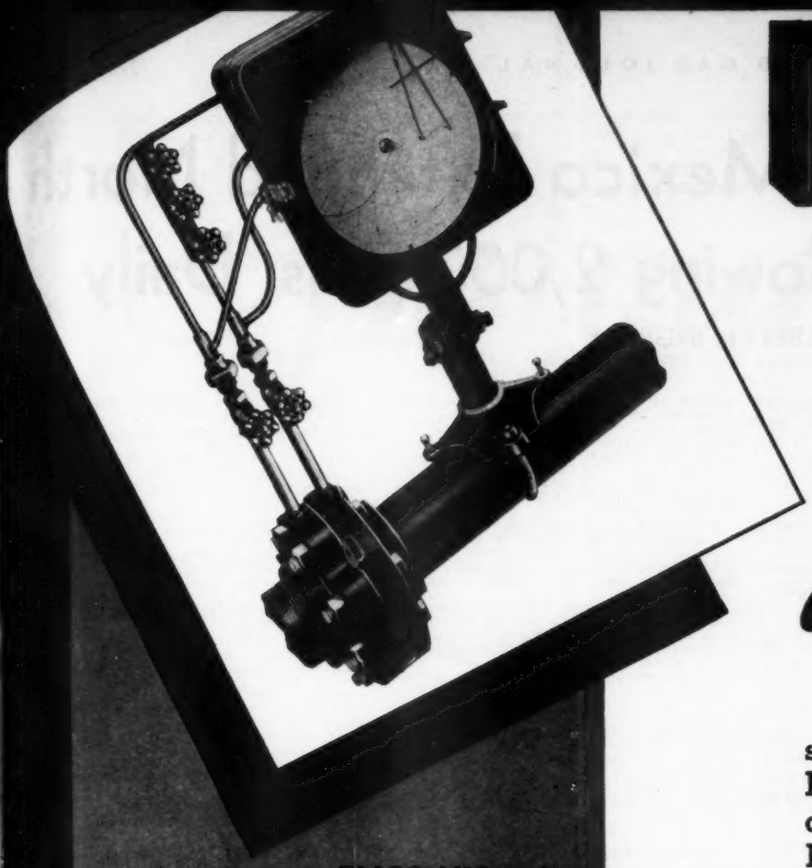
Plans for the purchase of right of way for the 162-mile natural gas pipe line, extending from Glenda, Wyo., to Bridgeport, Neb., to be constructed by the North Central Gas Co. of Nebraska and Wyoming at a cost approximating $1,250,000, are reported progressing, and laying of the line is scheduled to start in late summer or early fall. Contracts for the pipe line are said to have been let. Natural gas at present is being brought into that section of Nebraska through leased lines and it is reported that those lines in the future will be used only to transport crude oil.

### INDIANAPOLIS BUYS PLANT

INDIANAPOLIS, Ind., June 10.—The city of Indianapolis has purchased the Citizens Gas Co. and the plan is to mix natural gas with manufactured gas. The city will require approximately 4,000,000 to 5,000,000 feet a day. The city is seeking bids for a natural gas supply to be delivered at the city limits. One million dollars will be spent for extensions and improvements. The bonds have been sold. The bidders paid $7,685,000 for the $8,000,000 bond issue.

### PETROLIA GAS EXTENSIONS

PETROLIA, Ontario, June 8.—Union Gas Co. of Canada is spending approximately $8,000 this season in replacements and extensions to its local distributing system.



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# Cooper Pool in New Mexico Extended North by Humble Test, Flowing 2,000 Bbls. Daily

By TOLBERT R. INGRAM
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., June 10.—Allowable outlet for all New Mexico fields for first half of June is 57,000 bbls. daily, compared with 55,000 bbls. a month ago. Sun Oil Co. has made a location in the new Monument Pool in Lea County and the Amerada Petroleum Corp.'s location a mile south of the discovery will not be drilled at this time. The Eunice Pool had one completion in the Continental Oil Co.'s No. 20-C-4 State for 580 bbls. the first 24 hours. The Cooper Pool was extended 1½ miles north in the Humble Oil & Refining Co.'s No. 1 Coats, which flowed at the rate of 2,028 bbls. daily. One new location was reported in the Hobbs Pool. The Repollo Oil Co.'s No. 2 Grimes was completed for 40 bbls. an hour. The Repollo Oil Co.'s No. 1 Arnold, a wildcat in the Nadine area, was abandoned. The Continental Oil Co. completed a small well in San Juan County and made a location for a Pennsylvanian test in Sandoval County.

Colorado reported one new operation 10 miles south of the Greasewood Pool. It will go only 1,100 feet to the base of the Foxhills. The Oil City Petroleum Co.'s No. 1-A Garnett, in Archuleta County, a wildcat on which operations have been resumed, swabbed 30 bbls. in 24 hours. One well was abandoned without plugging in Pueblo County.

Ohio Oil Co.'s No. 10 Harrison-Cooper, in the Rock Creek Field, the discovery well in the Sundance formation, is pumping 100 bbls. daily, and its No. 6 Lamb, in the Lance Creek Field, was completed in the same formation for 4,000 bbls. Mid-American Oil Co.'s discovery well on Sheep Creek, in Fremont County, is pumping at the rate of 24 bbls. an hour.

Montana is showing increased activity with eight new locations in Cut Bank and one in the Kevin-Sunburst Field. Three completions were reported in Cut Bank. An oil discovery was reported on the Flat Coulee structure in Liberty County. Two failures, both shallow wells, were reported in Phillips County.

## NEW MEXICO

The allowable outlet for New Mexico producers for the first half of June was set at 57,000 bbls. daily, of which 55,000 bbls. was allocated to the State by the federal authorities and 2,000 bbls. by the state allocation committee to absorb shortage caused by marginal wells. This compares with a total for the State for the first half of May of 55,000 bbls. daily.

The allocations to areas outside of Lea County were 3,236 bbls. daily, compared with 3,520 bbls. for the first half of May and are distributed as follows:

| | Bbls. |
|---|---|
| Artesia | 2,200 |
| Hogback | 190 |
| Rattlesnake | 750 |
| Table Mesa | 85 |
| Aztec-Bloomfield | 10 |
| Total | 3,235 |

Allocation to Lea County marginal units (wells allowed to produce at capacity, are as follows:

| Field— | Units | Allocation |
|---|---|---|
| Cooper | 7 | 227 |
| Eunice | 6 | 510 |
| Hobbs | 1 | 7 |
| Jal | 21 | 1,239 |
| Lea | 3 | 185 |
| North Lea | 1 | 19 |
| Total | 39 | 2,178 |

After deducting allocation for marginal wells there remained 51,587 bbls. daily for 348 non-marginal units. This makes a top allowance of 148 bbls. daily for non-marginal wells. Total allocation for Lea County, including marginal and non-marginal wells is as follows:

| Field— | Units | Allocation |
|---|---|---|
| Cooper | 52 | 6,857 |
| Eunice | 62 | 8,798 |
| Jal | 45 | 4,782 |
| Lea | 11 | 1,369 |
| North Lea | 1 | 19 |
| Hobbs | 214 | 31,614 |
| Monument | 2 | 296 |
| Total, Lea County | 387 | 53,765 |

### Monument Area

Sun Oil Co. made a location in the new Monument Pool in its No. 1 Weir, C NE SE Section 35-19-36, a north offset to the Shell Petroleum Corp.'s No. 1-E State, a drilling well.

Amerada Petroleum Corp.'s No. 1 Andrews, C NW NW Section 12-20-36, a mile to the south of the discovery well, will not be drilled at this time and is an abandoned location.

Jeffers Oil Co.'s No. 1 Britt, C SE NW Sec. 7-20-37.
Location.

Shell Pet. Corp.'s No. 1-E State, C SE SE Sec. 35-19-36.
Drlg. 2,745 ft. in anhyd.

Sun Oil Co.'s No. 1 Weir, C NE SE Sec. 35-19-36.
Digging cellar and pits.

Superior Oil Co.'s No. 1 State, C NE NE Sec. 2-20-36.
Rigging up rotary.

Texas Co.'s No. 1 Saunders, C SE SW Sec. 18-19-37.
T.D. 2,570 ft.; W.O.C.; 9⅝-in. at 2,564 ft. with 800 sacks.

### Eunice Area

One completion was reported in the Eunice area in the Continental Oil Co.'s No. 20-C-4 State, C SE SW Section 20-21-36, an inside well. It was completed at 3,965 feet in the pay at 3,954-65 feet and made 580 bbls. the first 24 hours with 700,000 feet of gas through the 2½-inch tubing at 3,962 feet after treating with 3,000 gallons of acid. The 5½-inch is at 3,860 feet and the elevation is 3,647 feet.

Tide Water Oil Co. went back into its No. 4 State-Foster, C NE NE Section 8-21-36, which was completed at 3,887 feet for 486 bbls. last month, and treated it with 2,000 gallons of acid. After treatment it tested 1,800 bbls. and 5,500,000 feet of gas, open flow.

Amerada Pet. Corp.'s No. 1 Houston, C SE NE Sec. 7-21-36.
Drlg. 3,395 ft. in lime gas show at 3,281-87 ft.

Atlantic Oil Prod. Co.'s No. 2-C State, C SE SE Sec. 5-21-36.
Location.

Atlantic Oil Prod. Co.'s No. 1-G State, C SE SW Sec. 5-21-36.
Spudded May 5 set 12½-in. at 72 ft. with 150 sacks.

Atlantic Oil Prod. Co.'s No. 1-E State, C NE SW Sec. 5-21-36.
T.D. 3,833 ft., lime tested at 3,812 ft.; showed nothing; 7-in. cmtd. at 3,749 ft. with 850 sacks.

Continental Oil Co.'s No. 20-C-5 State, C SW SW Sec. 20-21-36.
Drlg. 3,520 ft. in lime; gas show 3,310-25 ft.

Continental Oil Co.'s No. 9-B-3 Meyers, C SE NW Sec. 9-21-36.
T.D. 3,785 ft.; W.O.C.; 5½-in. 3,743 ft.; 400 sacks; D.S. test at 3,742-85 ft. for 15 min. showed 300 ft. of mud and oil and 95,000 ft. of gas.

Continental Oil Co.'s No. 9-B4 Meyers, C NE NW Sec. 9-21-36.
Spud May 25; 10¾-in. at 94 ft. with 75 sacks; drlg. 655 ft., red beds.

Continental Oil Co.'s No. 30-A-2 Lockhart, C NE NE Sec. 30-21-36.
Drlg. 3,550 ft., lime; gas shows at 3,571-77 ft.; 3,649-54 ft., and 3,732-40 ft.

Empire G. & F. Co.'s No. 1-C State, NW NW SW Sec. 16-21-36.
S.D. 893 ft. in red beds.

General Crude Oil Co.'s No. 1-D State, C NW SW Sec. 32-21-36.
S.D. 70 ft.

Humble O. & R. Co.'s No. 2-B State, C NW [illegible] 29-21-36.
T.D. 3,907 ft.; 7-in. at 3,869 ft.; 600 sacks.

Humble O. & R. Co.'s No. 4-B State, C NW NE Sec. 29-21-36.
Rig.

Ohio Oil Co.'s No. 3 State-McDonald, C NE SW Sec. 16-22-36.
Drlg. plug; 7-in. at 3,686 ft. with 600 sacks; 3,000,000 ft. of gas at 3,675-3,739 ft.

Repollo Oil Co.'s No. 2 Adkins, SW SW NE Sec. 9-21-36.
T.D. 3,810 ft.; W.O.C. 7-in. 3,771 ft., 600 sacks; D.S. test 3,740-3,810 ft. 15 min. 500,000 ft. of gas, 600 ft. of oil; first oil at 3,740 ft.

Rowan Drlg. Co.'s No. 1 Elliott, C NE SW Sec. 17-22-37.
T.D. 4,075 ft., lime; prepare to test; D.S. test 3,970-4,014 ft. 15 min. 90 ft. of mud; at 3,900-4,014 ft. 1 hr. and 15 min., 270 ft. mud, 450 ft. sulphur wtr. with oil and gas shows.

Shell Pet. Corp.'s No. 1-A State, C SE NE Sec. 12-21-35.
T.D. 4,404 ft.; P.B. to 3,926 ft.; C.O. at 3,903 ft. and shot with 30 qts. and acidized with 2,000 gals.; reacidized with 3,000 gals.; swbd. 18 bbls. oil and 10 bbls. wtr.; R.U. machine to C.O.

Skelly Oil Co.'s No. 3-B State, C NE NW Sec. 16-21-36.
Drlg. salt 2,475 ft.

### Cooper Area

An important completion in the Cooper Pool was reported this week in the Humble Oil & Refining Co.'s No. 1 Coats, C NW NW Section 10-24-36, which extends the pool 1½ miles to the north of the nearest producer. This is the well which encountered a flow of 38,000,000 feet of gas at 3,355 feet last October and caught fire. After the fire was extinguished work of trying to kill the well began and was successful last month. It was drilled to 3,563 feet and flowed at the rate of 2,028 bbls. a day through the 2½-inch tubing on a three-fourths inch choke after acidizing with 2,000 gallons. The pay was at 3,532-63 feet and the elevation is 3,383 feet. The 7-inch is at 3,370 feet and the tubing at 3,558 feet.

Amerada Pet. Corp.'s No. 2 Isbell, C NE NE Sec. 15-24-36.
Drlg. plug; 9⅝-in. at 2,811 ft. with 50 sacks.

Amerada Pet. Corp.'s No. 3 Everett, C NE SE Sec. 34-24-36.
Rigging rotary.

Amos G. Carter et al's No. 1 Mattix, C SE NW Sec. 3-24-37.
Drlg. lime 3,586 ft.; 300 ft. oil in hole at 3,570-74 ft. in 1 hr.; C.O. and bailing.

Continental Oil Co.'s No. 14-A-4 Vaughn, C NW NW Sec. 14-24-36.
Location.

Continental Oil Co.'s No. 27-A-1 Gates, C SE SE Sec. 27-24-36.
Location.

Continental Oil Co.'s No. 14-A-2 Vaughn, C SW NW Sec. 14-24-36.
Building rig.

Continental Oil Co.'s No. 15-A-3 Vaughn, C NE SE Sec. 15-24-36.
Building rig.

Continental Oil Co.'s No. 15-A-2 Vaughn, C SW SE Sec. 15-24-36.
Location.

Continental Oil Co.'s No. 23-A-2 Gates, C NW NW Sec. 23-24-36.
Rig.

Continental Oil Co.'s No. 26-A-1 Gates, C SW SW Sec. 26-24-36.
T.D. 3,470 ft.; D.S. test at 3,445-70 ft.; 1,500,000 ft. of gas and oil shows.

Empire G. & F. Co.'s No. 4 Everett, C SW SW Sec. 35-24-36.
Drlg. lime 3,151 ft.

Humble O. & R. Co.'s No. 2 Coats, SWL NW NE Sec. 10-24-36.
S.D. 3,394 ft.

Simms Oil Co.'s No. 1 Woolworth, C SE NE Sec. 25-24-36.
Running 5½-in. at 3,464 ft., T.D.

Stanolind O. & G. Co.'s No. 4-A Meyers, C NE NW Sec. 22-24-36.
T.D. 3,605 ft.; P.B. to 3,570 ft. and W.O.C.

Texas Co.'s No. 3-B Ogg, C NE NE Sec. 34-24-36.
Drlg. 3,040 ft., in new hole.

Tide Water Oil Co.'s No. 1 Woolworth, C SW SE Sec. 26-24-36.
Digging cellar.

### Jal Area

There were no completions or new locations in the Jal area.

Amerada Pet. Corp.'s No. 1 Dyer, C SW NE Sec. 21-25-37.
Drlg. 2,912 ft. in anhydrite; 9⅝-in cmtd. at 2,714 ft. with 500 sacks.

Byrd-Frost, Inc.'s No. 1-A Wells, SE SE NW Sec. 12-25-36.
S.D. 3,310 ft. for tubing; flowed open 42 bbls. per day; will acidize.

Byrd-Frost, Inc.'s No. 2-A Wells, SW SW NE Sec. 12-25-36.
Location.

Empire G. & F. Co.'s No. 2 Dyer, NW NW SE Sec. 31-25-37.
S.D. 3,200 ft. for drill pipe; 7-in. cmtd. at 3,100 ft. with 200 sacks.

E. B. Guess' No. 1-B Justis, SW NW NW Sec. 20-25-37.
S.D. 1,060 ft. in red beds.

Gypsy Oil Co.'s No. 1-B Arnott, NW SW SW Sec. 32-25-37.
T.D. 3,240 ft. in lime; 2-in. at 3,240 ft.; 2,500 ft. of fluid in 10 hrs., 75 ft. of drlg. wtr.; swbd. down and filled 250 ft. of sulphur wtr. in 2 hrs.; prep. to acidize; 5½-in. at 3,200 ft. with 300 sacks.

Gypsy Oil Co.'s No. 1 Arnott, C NE NW Sec. 2-25-36.
T.D. 3,450 ft.; swbd. dry; prep. to test; top saturation at 3,382 ft.

Gypsy Oil Co.'s No. 2 Arnott, C NW NE Sec. 2-25-36.
T.D. 3,360 ft.; prep. to core 7-in. at 3,349 ft. with 400 sacks; saturation at 3,385 ft.

Gypsy Oil Co.'s No. 3 Arnott, C NW NW Sec. 2-25-36.
Drlg. 3,148 ft. in anhydrite.

Gypsy Oil Co.'s No. 1-A Vinson Ramsey, C SE SE Sec. 12-26-36.
R.U. rotary.

R. H. Henderson et al's No. 1 Langile, C SE SE Sec. 8-25-37.
T.D. 2,875 ft.; cmtng. whipstock.

R. H. Henderson et al's No. 1 Ogg, C NW NE Sec. 11-25-36.
S.D. 5 ft.

Jeffers Oil Co.'s No. 1 Carlson, C NW SE Sec. 27-25-37.
S.D. 390 ft. in lime.

Tide Water Oil Co.'s No. 1 Coats, SE SE NW Sec. 31-25-37.
Drlg. lime 3,022 ft.

### Hobbs Area

One new location, one completion and one near completion were reported in the Hobbs Pool. The Gypsy Oil Co.'s No. 4 Graham-State, prematurely reported a completion last week at 4,191 feet, where it flowed 8,745 bbls. of fluid, of which 53 per cent was water, was deepened to 4,230 feet. At that depth the rig was damaged by fire and rebuilding is in progress. It is preparing to acidize.

Repollo Oil Co.'s No. 2 Grimes, SW SE NW Section 28-18-38, an old well on the northeastern side which was drilled deeper, was recompleted. Old total depth was 4,223 feet where it made 551 bbls. initial when completed in 1932. It was deepened to 4,268 feet and tested sulphur water. It was then plugged back to 4,238 feet and averaged 40 bbls. per hour through the 3-inch at 4,235 feet.

The new location is J. P. Cusack, Inc.'s No. 2 Moon, SW NW NE Section 28-18-38, an outside well on the northeastern side, one-third of a mile north of the same firm's No. 1 Moon. It is building rig.

Continental Oil Co.'s No. 13-B-1 State, C SE SW Sec. 13-18-37.
Drlg. 3,010 ft. in lime; gas show at 2,945-52 ft.

J. P. Cusack, Inc.'s No. 2 Moon, 1,315 ft. S of N line and 2,310 ft. W of E line, Sec. 28-18-38.
Building rig.

J. P. Cusack Inc.'s No. 1 Byers, 666 ft. from N line and 2,310 ft. from E line, Sec. 5-19-38.
Drlg. 3,453 ft. in lime; gas show at 3,015-20 ft.

J. P. Cusack, Inc.'s No. 1-B Moon, SW SE NE Sec. 28-18-38.
T.D. 4,216 ft.; oil at 4,157-4,216 ft.; tested 30 bbls. per hr. through 2½-in. at 4,216 ft.; acidized with 6,000 gals. and made 80 bbls. an hr.; re-treated with 6,000 gals. and testing.

National Securities Oil Co.'s No. 1 Linam, NE SE SW Sec. 33-18-37.
T.D. 4,506 ft.; P.B. to 4,238 ft.; S.D.O.

Noble & Co.'s No. 4-C State, 1,315 ft. from W and S lines, Sec. 24-18-37.
Location.

Shell Pet. Corp.'s No. 3 Sanger, SW NW SW Sec. 27-18-37.
Drlg. lime 3,935 ft.

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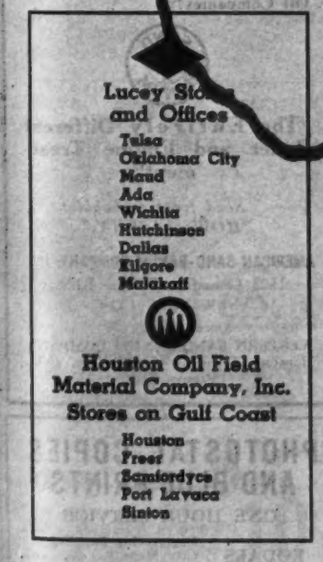


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For the protection of severe concentrated hazards where life, as well as property is at stake, oil men are coming more and more to depend on LUX automatic systems. This system goes into instant action from either the heat of fire or the concussion of an explosion.

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Stanolind O. & G. Co.'s No. 26 Byers, C SE NE Sec. 3-19-38.
Drlg. lime 3,945 ft.

**LEA AREA**

Texas Co.'s No. 1 Cole, C NE NE Sec. 35-19-33.
Drlg. lime 3,718 ft.
Anderson & Prichard's No. 1 Fisher, C SE NE Sec. 8-20-35.
Drlg. lime 3,670 ft.
Jeffers Oil Co.'s No. 1 Jiminez, C SW SE Sec. 12-20-33.
Drlg. in red beds 1,445 ft.
Jeffers Oil Co.'s No. 1 Etz, C NE SW Sec. 12-21-32.
T.D. 1,816 ft. in salt; recmtd. 8¼-in. with 30 sacks; W.O.C.

**CAPROCK AREA**

Vierson & Brown's No. 1 Robinson, C NW SE Sec. 14-11s-32.
Standing; rig completed.

### Nadine Area

The Repollo Oil Co.'s No. 1 Arnold, SW NW SE Section 12-20-38, 6 miles south of the Hobbs Pool, a wildcat which has been watched with considerable interest, failed to respond when acidized and was abandoned at a total depth of 4,757 feet. It was acidized at 4,510-4,628 feet with no results. It had sulphur water at 4,348-4,755 feet with some oil. The elevation is 3,567 feet.

### Maljamar Area

Maljamar Oil & Gas Co.'s No. 1 Pearl Miller, C NW SW Section 23-17-32, which will mark an extension of the pool 1 mile to the southeast, was deepened to 4,110 feet in sandy lime and showed an increase in oil and gas at 3,980-86 feet. It flowed and swabbed 90 bbls. daily.

**BERNALILLO COUNTY**

Norins Realty Co., Inc.'s No. 1 Gallegas grant, C NW NW Sec. 19-11n-4e.
Drlg. at 500 ft.

**CHAVES COUNTY**

Los Chaves Dev. Co.'s No. 1 Government, C NE Sec. 8-8s-23.
Drlg. below 500 ft.
Warman Oil Trust's No. 1 Weldon & Hoard, NW NW SE Sec. 9-14-25.
T.D. 1,660 ft. Recemtg. 5⅜-in. at 1,425 ft.

**CURRY COUNTY**

George Schoonmaker et al's No. 1 Hart, C SE SE Sec. 13-2n-32.
S.D. at 55 ft.

**GUADALUPE COUNTY**

Anton Chico Dev. Co., Ltd.'s No. 2 fee, NW NE SW Sec. 20-9n-17.
S.D. 900 ft.

**McKINLEY COUNTY**

Bennett & Lingfelter's No. 1 Lark Drlg. Co., NE NE NW Sec. 29-20-9w.
Drlg. 900 ft.
A. C. Kittel's No. 1, NW NW Sec. 32-20-9w.
Material on ground.
R. W. Sanderson et al's No. 1, NE SW Sec. 21-20-9w.
Material on ground.
David K. Stacey's No. 2 Webber, SW NW Sec. 29-20-9w.
Rig on ground.

**OTERO COUNTY**

Flynn, Welch & Yates' No. 1 Donahue, C NW NE Sec. 28-24-15.
Drlg. 1,465 ft. in black lime, 8¼-in. at 1,414 ft.

**QUAY COUNTY**

Quay County Dev. Co.'s No. 1, C SE SW Sec. 19-9n-32e.
Drlg. 450 ft.
H. F. Wilcox Oil & Gas Co.'s No. 1 Gurley, SE SW SE Sec. 32-7n-32.
S.D. 500 ft

**RIO ARRIBA COUNTY**

El Vado Structure Properties Co., Ltd.'s No. 1 Tierra Amarilla grant, NE (unsurveyed) Sec. 26-2s-1e.
Drlg. below 1,000 ft.

**ROOSEVELT COUNTY**

Claudell Dev. Co.'s No. 1 Wilmes, C SW SE Sec. 21-2s-36.
S.D.O. 3,667 ft.
K. M. Hancock et al's No. 1, 33 ft. from W line and 1,000 ft. from N line, Sec. 21-1n-37.
Moving in rotary equip.; derrick up.

### Sandoval County

Continental Oil Co. is starting an important wildcat on the Evans' 60,000-acre ranch in Sandoval and Valencia Counties, which it purchased last fall, and is drilling water well and building road for its No. 1 L-Bar Cattle Co., 630 feet north of east quarter corner, Section 2-13n-4w. The test, which has the Pennsylvanian at around 4,500 feet as its objective, starts in the Mancos shale 250 feet above the Dakota sand. The structure is known as the Lagunites, and is a large anticlinal dome running in a north-south direction and has a closure of 250 feet. The Evans ranch is located in Townships 12, 13, and 14n, Ranges 3 and 4w.

### San Juan County

Continental Oil Co.'s No. 44, NW NE NW Section 12-29-19, Rattlesnake Dome, an inside well, was completed in the Dakota at 820-830 feet for 40 bbls. of oil and 6 bbls. of water the first 24 hours.

We are advised by W. R. Webb that his No. 1 fee, NE NW Section 6-30-11w, Aztec district, has not been abandoned at 1,485 feet as reported. It was shot at 800 feet and 1,000 feet and showed an increase in both oil and gas.

Aztec Coop. Oil Co.'s No. 1 Aztec, SE SW Sec. 10-30n-11w.
Material on ground.
J. F. Cross et al's No. 1 Wilson, SW SW SE Sec. 17-30-11w.
S.D. 810 ft.
J. F. Cross' No. 6 Duggan, NE NE NE Sec. 20-29-11w.
S.D. 647 ft.
Cross & Poole's No. 1 Aztec, Sec. 1-30-11w.
Making water shutoff at 740 ft.
A. E. Haney's No. 1 Hare, SE SE Sec. 14-29-11w.
Drlg. 680 ft.
Kutz Canon O. & G. Co.'s No. 1 Day, SW SW SW Sec. 20-28-10.
Drlg. 4,370 ft. in sandy shale and shells and showing some increase in oil and gas. Preparing to unload 4,000 ft. of water and test.
R. C. Oswell's No. 4 Government, SW NW NE Sec. 34-30-11w.
S.D. 1,790 ft.
R. C. Oswell's No. 6 Government, SE NE Sec. 33-30-11w.
Spudded and S.D.
Reserve Oil Co.'s No. 6 Shaffer, SE NE SE Sec. 36-22n-14w.
Location.
San Juan Pet. Co.'s No. 1 Lemley, NE SE SE Sec. 32-30-11w.
S.D. 1,314 ft.
Nick Spatter's No. 1 fee, C NE SW Sec. 32-31-11w.
S.D. 1,480 ft. for pipe.
H. C. Stratton's No. 1 Hart, SW NE SE Sec. 25-30-12w.
S.D. 1,680 ft.

**SAN MIGUEL COUNTY**

Cabra Springs O. & G. Co.'s No. 1 Thompson, SW NE NE Sec. 22-12n-22e.
U.R. 6⅝-in. to bottom at 3,920 ft. for water shutoff.
Cabra Springs O. & G. Co.'s No. 2 West Pino Mesa, SW SW SW Sec. 31-12-22.
S.D. 312 ft.
Pioneer Oil Co.'s No. 2 Montezuma, CSL SE SW Sec. 14-15n-16.
Drlg. 300 ft.
Starr-Kennedy Oil Co.'s No. 3 Adams, NE NE NE Sec. 25-17-16.
Stdg. at 5,090 ft. after completing rig to resume following fire.

**SANTA FE COUNTY**

Elmer Fisher's No. 1 Hill, NE SW Sec. 6-10n-7e.
S.D. 2,750 ft. in schist.
Holmberg Interests' No. 1 Cantwell, NW NW NW Sec. 5-10n-9e.
Drlg. 2,570 ft.
Kelsey Clients Dev. Est.'s No. 2 State, C NW Sec. 22-10n-10e.
S.D. 1,450 ft.

**TORRANCE COUNTY**

48 Pet. Co.'s No. 1 Greenfield, C NW SW Sec. 17-9n-8e.
Drlg. 350 ft. shale and shells; 10-in. at 300 ft.

**UNION COUNTY**

Sierra Grande Oil Corp.'s No. 1 Rogers, C NE SW Sec. 4-29-29.
Drlg. 2,300 ft. in arkose.

**VALENCIA COUNTY**

Pres-Sel Dev. Co.'s No. 1 Morris, NE SE Sec. 30-12n-10w.
Drlg. 600 ft.
Ringle Dev. Co.'s No. 2 Tome grant, C NE SE Sec. 20-6n-3e.
Rigged and S.D.
Ringle Dev. Co.'s No. 1 Tome grant, C SE SE Sec. 36-6n-3e.
S.D. 400 ft.
Western Natural Resources Corp., Inc.'s No. 2 San Clemente, SE SE NW Sec. 5-6n-1e.
S.D. 6,001 ft.

### COLORADO

There were no completions in Colorado. One new operation was reported in Morgan County in eastern Colorado and one well was reported abandoned without plugging in Pueblo County.

The Morgan County operation is Swisher and associates' No. 1 Lunt, SE cor. Section 3-4n-60, near the town of Orchard, about 10 miles to the south of the Greasewood Pool. It began spudding May 11 to go to a sand expected in the base of the Foxhills at around 1,100 feet. The 8¼-inch was set at 50 feet and it is drilling in shale at 350 feet. The wells in the Greasewood Pool all went below 6,000 feet and obtained their production in the Muddy sand of the Dakota series. The Orchard test is based on geology by H. C. Beeler. The Western Leasing & Producing Co. owns a half interest in the block and in any production which may be encountered.

The well abandoned without plugging is the Hooker-Hill Syndicate's No. 1 Hartman, NW cor. Section 31-22-61, Pueblo County. It spudded a year ago and drilled to 400 feet last fall. Rig has been moved away. The operation was in the prairie country where a number of farmers joined together to drill for oil, gas or water, the latter being as important to some as oil, since the value of their land depended upon water for irrigation.

A wildcat which again is attracting some attention is the Oil City Petroleum Co.'s No. 1-A Garnett, NE NE SW Section 25-33-2e, Price district, in Archuleta County. Last December this well had a good show of oil at 970 feet. Little progress was made after that due to heavy snows, impassable roads, and difficulty in moving in fuel and supplies. It was finally deepened to 1,098 feet and then had to shut down until spring. Work was resumed recently. The hole has about 70 feet of cavings in it. On May 26 it was bailed and made 6 bbls. The next day it rigged up to swab and made 30 bbls. On the third day it swabbed 15 bbls. It was underreaming at last reports to lower the 6¼-inch to the bottom to shut off cavings and it was expected it would drill into the Muddy sand the last of this week.

**ADAMS COUNTY**

Riddle Pet. Co.'s No. 1 Baxter, C SW Sec. 2-3s-66w.
Standing partially rigged and drlg. wtr. well.

**ARCHULETA COUNTY**

Oil City Pet. Co.'s No. 1-A Garnett, NW NE SW Sec. 25-33n-2e.
T.D. 1,098 ft.; U.R. 6¼-in. to bottom.
Navajo Oil Co.'s No. 1 Crowley, SW SW NE Sec. 11-32n-1e.
S.D. 537 ft.

**BACA COUNTY**

J. H. Everett et al's No. 1, 330 ft. NW cor. Sec. 24-32-48.
Drlg. wtr. well and moving in rotary equipment.

**BOULDER COUNTY**

Leslie R. Steele et al's No. 1 Maxwell, SW NE NW Sec. 24-1n-71.
T.D. 925 ft.; straightening hole.

**GRAND COUNTY**

Colorado Oil Ref. Co.'s No. 1 Linke, NE SW SW Sec. 13-1n-77w.
Drlg. 1,900 ft.; increase in gas show.
Interstate O. & R. Co.'s No. 1 Hinman, NE SE NW Sec. 11-2n-81.
S.D. 1,997 ft.

**HUERFANO COUNTY**

S. W. Pressey's No. 1 Ojo, SW NE Sec. 10-29-69.
S.D. 2,550 ft.

**JACKSON COUNTY**

Colorado Oil Ref. Co.'s No. 1 North Park Coal, NW NW Sec. 18-9n-78.
T.D. 1,805 ft.; U.R. 15½-in. to set at 500 ft.


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Continental Oil Co.'s No. 3 Hoye, NW NW NE Sec. 34-9n-78.
T.D. 2,490 ft.; P.B. to 2,330 ft.; drlg. and reaming at 2,441 ft.

**JEFFERSON COUNTY**

Ruby Hill O. & G. Co.'s No. 1 Braden, SE cor. Sec. 24-4s-69.
S.D. 4,280 ft.

**LAS ANIMAS COUNTY**

Mountain States Oil Corp.'s No. 1 Nikola, C NE SE Sec. 10-34-62.
S.D. 1,640 ft.

**LINCOLN COUNTY**

Consolidated Smelting & Metals Co.'s No. 1 Hancock, NE NE SW Sec. 7-17s-52.
T.D. 1,190 ft.; C.O.

**MOFFAT COUNTY**

Stanolind O. & G. Co.'s No. 5-S Parkinson, NW cor. SE Sec. 22-4n-92.
Digging cellar and pits.
Stanolind O. & G. Co.'s No. 16-SD Shaw, SE NW NW Sec. 27-4n-92.
Coring at 3,290 ft.; top first Morrison 3,147 ft.; top third Morrison 3,290 ft.
Texas Co.'s No. 2 Iles Investment, 620 ft. S of N line and 220 ft. E of W line, Lot 4, Sec. 23-4n-92.
Bldg. rig and moving in tools.
Mountain Fuel Supply Co.'s No. 1 Murdock, SE SE NE Sec. 24-12n-101.
Some materials on location.

**MONTEZUMA COUNTY**

McElmo Oil Co.'s No. 1 West, NE NW NE Sec. 31-36n-17w.
S.D. 3,131 ft. with 1,200 ft. oil in hole.

**MORGAN COUNTY**

Swisher et al's No. 1 Lunt, 92 ft. W of E line and 360 ft. N of S line, Sec. 3-4n-60.
Drlg. shale 350 ft.

**PARK COUNTY**

South Park Oil Co.'s No. 1 State, SE SE SW Sec. 16-11s-75.
T.D. 1,415 ft.; fighting cave and trying to land 10-in. on bottom.

**PROWERS COUNTY**

Trojan O. & G. Co.'s No. 1 Lotus Oil, NW NE NE Sec. 15-23-46.
T.D. 5,227 ft.; drilled out plug to bottom after cmtng. off caves.

## WYOMING

### Big Horn County

J. W. Bales' No. 1 Parker, C SW SW Sec. 23-49-89.
S.D. 125 ft.
Peter Evanoff's No. 1 Griffin, Lot 60, Sec. 4-55-97.
S.D. 1,594 ft.
Peter Evanoff's No. 2 Griffin, Lot 53, Sec. 28-55-97.
Rig.
Peter Evanoff, et al's No. 1 McAllister, Lot 40, Sec. 2-55-97.
Suspended location.
Ohio Oil Co.'s No. 2 Sidon Canal, C SW SW Sec. 24-56-97.
Drlg. 3,784 ft.
Ohio Oil Co.'s No. 3 Byron Union, SE NW NE Sec. 22-56-97.
Drlg. 425 ft.; 12½-in. at 421 ft.
Ohio Oil Co.'s No. 4 Byron Union, SW NE Sec. 22-56-97.
Bldg. derrick.
Taylor Oil Co.'s No. 1 Hoskins, Lot 5 (SE SE), Sec. 25-56-97.
T.D. 5,275 ft.; redrlg. at 4,850 ft.
Wyoming Oil & Refining Co.'s No. 1 Evans, NE NE NW Sec. 12-49-91.
Drlg. 400 ft.
Yale Oil Corp.'s No. 1 Blakesley, NE NW Sec. 28-49-91.
S.D. 1,425 ft.

### Carbon County

Ohio Oil Co.'s No. 10 Harrison & Cooper, NE NW SW Section 35-20-78, Rock Creek Field, the discovery well in the Sundance formation in this field, has been completed in the upper Sundance at 3,060-3,196 feet and is pumping 100 bbls. a day. Rock Creek Field was discovered in 1918 and has produced up to date more than 15,000,000 bbls. of crude from the sands in the Dakota formation. Last February this well started drilling deeper to test the Sundance. It may be deepened to the lower Sundance at a later date. There was not enough gas to flow the well.

Ohio Oil Co.'s No. 4 Diamond Cattle, SE SW NW Sec. 35-20-78.
Rigging up.
Earl W. Reeder, Inc.'s No. 1 Whitford, SW SE SE Sec. 24-20-84.
T.D. 4,365 ft.; cmtd. hole and drlg. by bailer.
Earl W. Reeder, Inc.'s No. 1 Union Pacific, C SW SW Sec. 19-20-83.
S.D. 5,931 ft.; may deepen.

**CONVERSE COUNTY**

Chadron-Osage Oil Co.'s No. 1 State, SW cor. Sec. 16-32-69.
S.D. 460 ft.
Continental Oil Co.'s No. 9 Whiteside, 3,680 ft. S of N line and 1,072 ft. W of E line, Sec. 7-33-76.
Rigging.
Otto Olston et al's No. 1 Carey, Sec. 6-32-74.
S.D. 642 ft.
John Ackard's No. 1 Daniels, SW SW SE Sec. 17-32-71.
Drlg. below 2,600 ft.

### Fremont County

The Mid-American Oil Co.'s No. 2 Government, C NE SW Section 14-28-92, the discovery well in the Sheep Creek Field, was given another pumping test the past week and showed up much better than the previous reports. In view of the number of widely varying statements which have been current in regard to this well, President Harold L. Nutting, in response to a request of the writer, has furnished some official details of the discovery. The total depth is 2,254 feet. The top of the Embar was at 2,020 feet and between that depth and 2,160 feet approximately 130 feet of saturated lime was encountered. The oil appeared quite heavy. This oil was cased off and no production test was made. Drilling then continued to the present total depth and the oil in the last pay appeared quite light and became lighter with depth. It has a mixed base and tests slightly above 26 gravity. Considerable trouble was encountered in making a pumping test, but on June 3 the well again was back on the pump and when President Nutting left the well the following day he said it was pumping at the rate of 24 bbls. an hour, more than the pump could safely handle over a period of time. Initial tests, he said, prior to acidizing could not be accepted as an indication of the well's capacity because the tubing would not permit of more than 5 bbls. an hour. The company's No. 3 well is rigging up and will go to the Tensleep where light oil similar to that in Lost Soldier is expected.

**FREMONT COUNTY**

Mid-American Oil Co.'s No. 3 Government, NW NE SW Sec. 14-28-92.
Rigging.
Monongahela Oil Co.'s No. 1 Wisda, NE SE SE Sec. 13-28-93.
T.D. 2,970 ft.; rigged and ready to resume.
Tropic Oil Co.'s No. 1 Government, C SE SW Sec. 34-27-90.
Drlg. 2,701 ft.

**HOT SPRINGS COUNTY**

Argo Oil Co.'s No. 16 Ellen, NE SE NW Sec. 14-44-98.
Drlg. 850 ft.
Fern Oil Co.'s No. 1 Government, CSL SW SW Sec. 11-44-98.
Moving in materials.

**LINCOLN COUNTY**

Senrab Oil Co.'s No. 3 Government, N SE NW Sec. 10-26-113.
S.D. 1,011 ft.

### Niobrara County

The Ohio Oil Co.'s No. 6 Lamb, C SE SE Section 32-36-65, Lance Creek Field, the second well to drill through the Sundance into the top of the red beds, the previous tests having stopped before going through that formation, proved to be another big well and is estimated at 4,000 bbls. a day on the basis of preliminary tests. It was drilled to 3,904 feet, in the top of the red beds, and is producing from the second and third benches of the Sundance at 3,788-3,832 and 3,850-95 feet. The first bench was at 3,629-52 feet. The 7-inch was set at 3,791 feet.

Argo Oil Co.'s No. 3 Elliott, C NE NE Sec. 6-35-65.
Coring at 3,648 ft.
Black Hills Ref. Co.'s No. 1 Wright, SE SE SW Sec. 22-36-64.
Moving in rotary equipment.
Continental Oil Co.'s No. 2 Schuricht, C SE NE Sec. 6-35-65.
S.D. before spudding on acct. of mud and water.
Continental Oil Co.'s No. 1 Apex-3, SW NE Sec. 34-36-65.
T.D. 3,538 ft.; cmtd. back to 3,444 ft. to sidetrack bailer.
Interstate Oil & Ref. Co.'s No. 1 Morrell, NW NE SE Sec. 2-39-61.
S.D. 3,030 ft.
Fall River Royalty & Producers Co.'s No. 3-L, CEL NE NE Sec. 2-39-61.
Drlg. 300 ft.
Ohio Oil Co.'s No. 2 Lamb, NE NW NE Sec. 5-35-65.
Old well preparing to drill deeper from 2,952 ft.
S. & H. Dev. Co.'s No. 1-A Olinger, SE NE NW Sec. 1-36-63.
Drlg. 1,460 ft.

**PARK COUNTY**

George T. Beck's No. 1 fee, NW SE NW Sec. 27-53-101.
Resuming at 1,181 ft.
Continental Oil Co.'s No. 3 Northern Pacific, NW SE SE Sec. 23-58-98.
Drlg. 248 ft.
Garland Oil Co.'s No. 2 Government, SE NE NW Sec. 14-56-98.
S.D. 2,166 ft.
Resolute Oil Co.'s No. 1 State, C NW SW Sec. 16-57-101.
S.D. 3,608 ft.
Texas Co.'s No. 3 Ora Sonners, 660 ft. N of S line and 590 ft. W of E line, NE NW Sec. 29-51-100.
Completed at 3,501 ft.; not tested.; rigging up pump. equip.

**SHERIDAN COUNTY**

Beaver Creek Oil Syndicate's No. 1 Allison, SW SE Sec. 15-55-85.
S.D. 2,660 ft.

**SUBLET COUNTY**

California Petroleum Corp.'s No. 4-K, SW SE SW Sec. 34-27n-113.
Completed at 824 ft. for 37 bbls. first 24 hrs.
Piney-La Barge Oil Co.'s No. 2 Government, CEL NE NW Sec. 18-28-113.
Drlg. below 520 ft.

**SWEETWATER COUNTY**

Mountain Fuel Supply Co.'s No. 1 Joseph Brooks, C NW NE Sec. 15-16-104.
Suspended location.
Vermillion Oil Co.'s No. 1 State, SW cor. Sec. 16-12n-99.
S.D. 4,685 ft.
Wyoming-California Pet. Co.'s No. 1 Government, SE cor. Sec. 20-16-104.
Location.

**WASHAKIE COUNTY**

C. L. Brome et al's No. 3 Government, SW NW NW Sec. 31-48-90.
Drlg. 1,136 ft.
Chris Oil Syndicate's No. 1 Government, C SW SW Sec. 31-48-90.
T.D. 1,830 ft.; fshg. for tools.
Wyoming Oil & Ref. Co.'s No. 1 Frison, NW SW NW Sec. 14-48-91.
Drlg. 1,700 ft.

**WESTON COUNTY**

Conway Oil Corp.'s No. 1 Government, C SE NW Sec. 7-41-60.
Drlg. 1,075 ft.
Carl Cundy's No. 9 Government, NW cor. NE Sec. 31-46-63.
Rigged and ready to spud.
F. L. Dilger & Son's No. 1 Thierry, NW NW SW Sec. 32-46-63.
Rigged and ready to spud.
Chas. Goodell et al's No. 1 State, C NE NE Sec. 23-44-63.
Rigging up cable tools.
(Formerly Gibson Oil Synd.)
La Lleishe Oil Co.'s No. 18 fee, C SW SW Sec. 17-46-63.
S.D. 360 ft. for casing.

## MONTANA

Increased activity in drilling operations in the Kevin-Sunburst Field again is threatening the crude oil market in that district and purchasers have resumed the proration of production. The buyers have been taking 100 per cent of production for the past month or more, but beginning with June they have gone back to 60 per cent of December runs. The field showed very little activity in the development of new production until the acidizing of wells increased the yield of the stripper wells to a profitable basis at present prices. The refiners, especially those in Canada, are taking a considerable part of their requirements from the Cut Bank Field which has further tended to slow down the market for Kevin-Sunburst crude.

**BIG HORN COUNTY**

Enterprise Oil Co. et al's No. 2 Lynde, SW SW SE Sec. 21-6s-35e.
Drlg. 3,655 ft.

**CARBON COUNTY**

Ohio Oil Co.'s No. 15 Montana Industrial, C NE NE Sec. 11-7s-21.
Drlg. 2,933 ft. in shale.

**CHOTEAU COUNTY**

Mills & Decker's No. 1, NE NW Sec. 29-27n-13e.
Spudding.

**FERGUS COUNTY**

Button Butte O. & G. Co.'s No. 1 Woodward, SE SE SW Sec. 20-14n-24.
Drlg. 3,095 ft.
S. W. Pennock et al's No. 1 Nordheim, NW NE NE Sec. 6-21n-18e.
Drlg. 650 ft.

(Continued on Page 136)


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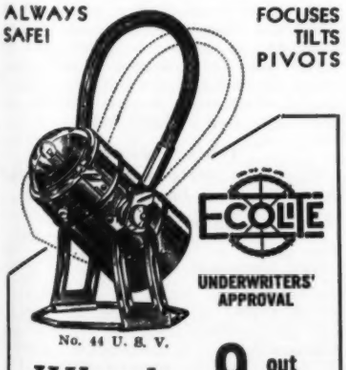

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# Small Wells the Rule in Completions Reported in Louisiana-Arkansas-Mississippi District

By J. R. CRUMPTON
Staff Correspondent, Louisiana-Arkansas

SHREVEPORT, La., June 10.—Three wildcats in widely separated North Louisiana areas were waiting on cement this week after setting casing to test shows of oil or gas. A test in East Carroll Parish is arranging to make a drill stem test of the Midway formation and various other wildcats have treated chalk formations in the DeSoto-Sabine areas. Thirteen completions were reported from three states and with one exception the producers were small, the Jackson Field in Mississippi furnishing one good gas well. Twelve new locations were staked in the three districts.

### NORTH LOUISIANA

Several wildcats in the North Louisiana district reported last week with shows of oil or gas have set casing over the pay horizons but have not yet drilled plug to test. Plain Dealing Syndicate's No. 1 L. A. King, Section 36-23-13, about 3 miles northeast of Plain Dealing in the northern part of Bossier Parish, has set 4¾-inch casing at 2,824 feet with the hole bottomed at 2,840 feet. A drill stem test last week developed an estimated flow of 5,000,000 feet of gas from the Blossom sand, indicating a new gas producing area in Northwest Louisiana.

Three-quarters of a mile east of the Sligo Field, United Gas Public Service Co.'s No. 1-A R. V. Kerr unit, Section 24-17-12, has drilled plug to test at 4,295 feet. The well has the earmarks of a good gasser from this depth which is in Oolitic lime of the Glen Rose formation in the upper Trinity.

South of the town of Plain Dealing, W. A. Kirkland, trustee's No. 1 Jarrett & McKeller, Section 3-21-13, is drilling in chalk rock at 2,100 feet. About 3 miles west of the old Spider area in DeSoto Parish, E. L. Foster's No. 1 Youngblood, Section 9-11-14, blew out while the crew was setting liner with an estimated flow of 3,000,000 feet of gas with a small spray of salt water. Seven-inch casing had been set at 2,735 feet with the hole bottomed at 2,860 feet.

In East Carroll Parish, O. G. Collins and others' No. 1 H. L. Hunt, Section 26-22-13e, is arranging to make a drill stem test in the Midway at 3,035 feet. A. D. King, trustee's No. 1 Sallie Roach, Section 4-14-16, in the Keatchie area, southwestern Caddo Parish, has set 6-inch casing with packer at 2,634 feet, inserted liner and bailing a show of oil with some salt water from 2,712 feet. It is reported that acid may be used.

#### Other Wildcats

Other North Louisiana wildcats, either testing or treating with acid to test follow: DeSoto Parish, Ed Safford and others' No. 1 Thigpen, Section 33-13-12, a few miles north of the town of Mansfield, tested a slight show of oil after using acid in chalk rock at 1,730 feet. Ben F. Smith's No. 1 J. W. Porter, Section 25-12-13, topped the Nacatoch at 1,064 feet, top of chalk rock at 1,150 feet with the base at 1,775 feet and is coring at 2,803 feet. C. T. Ruffin's No. 1 Lee, Section 33-14-13, is drilling in chalk at 1,810 feet after setting 10-inch surface casing at 88 feet. South of the Converse Field, Sabine Parish, Laurel Petroleum Co.'s No. 1 Long-Bell Lumber Co., Section 14-8-14, tested dry in chalk rock without the use of acid at 1,974 feet and is testing at 2,280 feet. E. T. Oakes' No. 1 H. W. Patton estate, Section 1-20-5, a contemplated deep test in the Lisbon area northeast of the Sugar Creek gas field in Claiborne Parish, has set 12½-inch casing at 654 feet.

The Blanchard Field in Caddo Parish may have another prolific gas producing horizon as a result of shooting casing preparatory to abandoning an old well completed as a fair gasser from 2,778 feet in 1930. Junior Oil & Gas Co.'s No. 1 Breard, Section 9-18-16, blew in as a good gasser after lifting casing which was shot at 1,990 feet. The pay is believed to be coming from the Blossom sand, which has consistently failed to produce on the southern extremity of the field. Practically all the gas in this area comes from the Nacatoch around the 900-foot level.

About 3 miles east of production of the old Caddo Field, Simplex Oil Co.'s No. 1 Keith, Section 18-20-14, tested dry on drill stem test after plugging back to 2,340 feet from an old total depth of 2,748 feet. Another barren test, Sterling Oil & Refining Co.'s No. 1 Long-Bell Lumber Co., Section 19-13-9, Red River Parish, had salt water at 1,175 feet. The hole was plugged back from an old total depth of 3,008 feet.

#### One Oil Well, Three Gas Wells

The North Louisiana completions consisted of three gas wells, one oil well and four dry holes. The lone oil producer, Roy C. Gholson's No. 1 Donham, Section 16-20-15, Caddo Parish, is pumping 15 bbls. from 2,208 feet. In the same area, the Leonard Co.'s No. 1 Kuhn, Section 7-20-15, is a small gasser, estimated at 40,000 feet from 972 feet. In DeSoto Parish, W. T. Coleman's No. 1 Walker, Section 18-12-11, is estimated at 1,000,000 feet of gas with 155 pounds rock pressure from 881 feet. The third gasser, J. E. Farrell & Co.'s No. 4 State of Louisiana, Section 50-20-4e, Ouachita Parish, gauged 11,500,000 feet with 282 pounds rock pressure from 2,145 feet.

The only wildcat of note completed during the past week was a failure. Virgil Likens' No. 1 E. L. Stewart, Section 23-18-10, checked low all along the log and was abandoned in Blossom sand at 3,014 feet. The top of the Arkadelphia was logged at 1,376 feet, top of Nacatoch at 1,472 feet and the Blossom was topped at 2,265 feet. Eleven feet of sand was cored saturated with salt water. The well is located northeast of the Bistenau Lake gas area, about 6 miles from the Bossier Parish line in the western central part of Webster Parish.

Other North Louisiana completions: Caddo Parish, Alaska Oil Corp.'s No. 1 Dickerson, Section 15-19-14, salt water and abandoned at 2,469 feet. Converse area, Sabine Parish, Strickland and others' No. 1 Whitney Corp., junked and abandoned at 1,590 feet; Many area of the Zwolle Field, Hunter Co.'s No. 15 Sabine Lumber Co., Section 1-7-12, abandoned after using acid at 2,700 feet.

Of the nine new locations staked in this district, four were in the recently hot extension of the old Caddo Field. In Caldwell Parish, G. D. Davis is arranging to deepen his No. 1 Louisiana-Central Lumber Co., Section 14-11-3e. The well was abandoned as dry in October, 1934, at 1,934 feet. In Grant Parish, Alexander and others are moving in rig on No. 1 Maxwell in Section 9-9-1e. American Liberty Oil Co. is rigging up on two new tests in separate parishes. No. 1 Lusk in Jackson Parish is located in Section 1-16-1w, and No. 1 Golson in Ouachita Parish is in Section 25-17-1e. A derrick pattern is on location in Winn Parish for Parson and others' No. 1 Tremont Lumber Co. in Section 10-12-2w.

### ARKANSAS

Only three completions came in from the Arkansas district, two dry holes and one small oil well with two new locations to offset the failures. In the Columbia County area of the Stephens Field, O. F. Whittaker's No. 1 F. Hall, Section 11-15-20, is a 16-bbl. pumper from 2,140 feet. Two Sevier County tests are both failures. Pendleton & Vaughn's No. 1 fee, Section 35-9-30, encountered a flow of fresh water and was abandoned at 1,172 feet and the same operators' No. 1 Harrison estate was finally junked and abandoned at 1,185 feet after shooting the well at 1,125 feet where a gas show was reported while drilling. Six-inch casing had been set in the hole at 1,155 feet. A new location has been staked by these operators in the southwest corner of Section 35-9-13, fee name, No. 1 J. E. Johnson.

Operations on Gulf Refining Co.'s No. 49 Lewis Werner, Section 5-16-16, a deep test on the western flank of the old Smackover Field, is still the center of interest in that area. Seven-inch casing has been set at 6,224 feet with the bottom of the hole at 6,431 feet. The formation is reported to be hard black lime with a slight show of oil. The casing was set to test the lime show and also for protection of the hole in drilling deeper. It is the longest string of casing yet set in a South Arkansas test. H. L. Hunt, Inc.'s No. 15 E. F. Gregory, Section 10-17-14, a deep test in the Rainbow Field, recently set 7-inch at 5,834 feet, topped rock salt at 6,815 feet and drilled 99 feet into this formation before plugging back to test the upper sands in the Rainbow Field.

### MISSISSIPPI

The Hinds County area of the Jackson Field broke even on results of two completions. T. H. Robertson and others' No. 1 Martin, Section 26-6n-1e, gauged 49,888,000 feet of gas from 2,479 feet. In Section 25-6n-1e, Weaver & Alexander's No. 1 R. W. Walthall was abandoned in salt water at 2,464 feet. One new operation is rigging up in the Rankin County area of this field, Cleve Love and others' No. 1 Ascher, Section 18-5n-2e.

A wildcat in Boliver County has resumed operations after being shut down at 20 feet since last November. White & Jones' No. 1 Ballou, Section 17-24n-1e, has set 10-inch surface casing at 295 feet and drilling in rock at 746 feet. In Washington County, Mid-Continent Development Co.'s No. 1 Lee, Section 33-15n-8w, has drill stem stuck at 2,052 feet. A Winston County wildcat, Jack Vale and others' No. 1 Moody, Section 3-13n-14e, is drilling in green sand at 1,850 feet. In Covington County, Alabama, Geometer Production Co.'s No. 1 A. B. Galbreath, Section 8-2n-14e, is drilling in sand at 6,100 feet.

#### Crude Production

Estimated daily average production for the week ending June 8 follows:

**NORTH LOUISIANA**

| | Bbls. |
|---|---|
| Bellevue | 575 |
| Caddo, light | 5,095 |
| Caddo, heavy | 2,075 |
| Converse | 1,140 |
| Cotton Valley | 440 |
| DeSoto and Red River | 1,365 |
| Elm Grove | 270 |
| Haynesville | 3,450 |
| Holly | 155 |
| Homer | 2,675 |
| Pleasant Hill | 165 |
| Sarepta-Carterville | 550 |
| Urania | 3,045 |
| Zwolle | 1,850 |
| Total | 22,940 |

**SOUTH ARKANSAS**

| | |
|---|---|
| Champagnolle | 2,350 |
| El Dorado | 2,220 |
| Lisbon | 305 |
| Miller County | 1,710 |
| Nevada | 885 |
| Smackover, light | 2,275 |
| Smackover, heavy | 18,545 |
| Stephens | 640 |
| Urbana | 2,150 |
| Total | 31,030 |

## Wildcat Operations in Louisiana-Arkansas

(Rotary operations unless otherwise designated)

**NORTH LOUISIANA**
**AVOYELLES PARISH**

Bell Oil Co.'s No. 2 Thompson-Koltz, 450 ft. S. 350 ft. E. NW cor. Sec. 11-2n-5e.
Partly R.U. and S.D.

Southern Star Pet. Co.'s No. 1 O. G. Boyette, Sec. 28-3-5e.
S.D. for high wtr. 3,875 ft.

**BOSSIER PARISH**

W. A. Kirkland's No. 1 Jarrett & McKeller, 330 ft. N and W. S cor. NW NW Sec. 3-21-13.
Drlg. 2,100 ft.

Leonard Co.'s No. 1 Pearson, 250 ft. S and E of C Sec. 22-21-14.
Fishing for D.S. 3,300 ft.

Plain Dealing Synd.'s No. 1 L. A. King, 300 ft. S and E. NW cor. NE NE Sec. 36-23-13.
Set 4¾-in. 2,824 ft.; T.D. 2,840 ft.

Richplane Oil Co.'s No. 1-A S. H. Bollinger, Sec. 22-22-13.
Set 10-in. 40 ft.

Scott & Howard's No. 1 Sherrill, Sec. 13-19-12.
Rig moved and abd.

R. L. Skidmore et al's No. 1 Davis, Sec. 12-18-13.
S.D. 1,150 ft.

Triangle Drlg. Co.'s No. 1-A State of La., Sec. 23-17-12, 1,000 ft. E. 2,640 ft. S. NW cor.
Coring 3,692 ft.

United Gas Pub. Serv. Co.'s No. 1-A R. V. Kerr Unit, NE cor. Sec. 24-17-12.
Testing 4,295 ft.

**CADDO PARISH**

Alaska Oil Corp.'s No. 1 Dickerson, 150 ft. N and E. SW cor. NW NW.
S.W. and abd. 2,469 ft.

Nick Babare's No. 1 Gibbs, Sec. 16-20-15, W.O.S.R. 2,265 ft.

Babare and Ark.-La. Gas Co.'s No. 1 fee, NE cor. SE SE Sec. 16-20-15.
Rigging up.

J. Ed Bailey, tr.'s No. 1 Hartzo, NW cor. NE NW Sec. 28-22-16.
S.D. 1,226 ft.

Barnsdall Oil Co.'s No. 2 School fee, SE cor. NW SE Sec. 16-20-15.
Rigging up.

Cal-La. Devel. Co.'s No. 1 Glassell, NW NE Sec. 11-19-15.
Set. 10-in. 40 ft.

Holly Oil Co.'s No. 1 Thigpen & Herold, Sec. 15-20-15.
Drlg. 1,400 ft.

Hillman et al's No. 1 J. S. Noel Est., NE NE Sec. 12-20-16.
Set 7-in. 814 ft.; tested dry 835 ft.; drlg. 1,915 ft.

A. D. King, tr.'s No. 1 Roach, 641 ft. E. 375 ft. N. SW cor. SE Sec. 4-14-16.
Set 6-in. with packer 2,634 ft.; testing 2,712 ft.

Leonard Co.'s No. 1 M. A. Dickson, 1,650 ft. S. 1,260 ft. E. NW cor. Sec. 36-21-15.
Drlg. 1,956 ft.

Leonard Co.'s No. 2 Green, SW SW Sec. 8-20-15.
Rigging up.

Leonard Co.'s No. 1 Kuhn, C N½ NW SW Sec. 7-20-15.
Comp.; est. 40,000 ft. of gas, 972 ft.

Murray Oil Co.'s No. 2 Noel, 495 ft. S. 735 ft. E. NW cor. SW Sec. 15-20-15.
Rigging up.

Press & Lambert's No. 2 Hughes, 350 ft. N and W of C Sec. 15-20-15.
Rigging up.

Recovery Oil Co.'s No. 1 W. L. Sibley, Sec. 15-19-14.
Arranging to set csg. 2,448 ft.

Texas Co.'s No. 4 School fee, Sec. 16-20-15.
Set 6-in. 2,159 ft.

(Continued on Page 139)

# California Producers Have Agreed Upon Plan for Going Back to Voluntary Curtailment Basis

By L. P. STOCKMAN
Staff Correspondent, California Fields

LOS ANGELES, Calif., June 10.—California oil producers, recognizing a serious situation resulting from annulment of the oil code because the State does not have any regulatory statutes, have approved a plan to go back on a voluntary basis. Approximately 800 producers met in Los Angeles Friday night and pledged their support of curtailment. A committee consisting of Neal Anderson, president of the Oil Producers Agency, Lawrence Kelly, and Clifford Lord of Los Angeles, Angus Crites of Bakersfield, Dick Mitchell of Long Beach and Cecil Rood of Huntington Beach, was appointed by Chairman Jack Doyle to confer with all major companies to work out a plan whereby the large companies might agree to limit reductions in light refining crude stocks and allocate this amount to several fields in need of relief because of overproduction on the part of certain operators. Although representatives of all the major companies were present at the meeting they did not take any part in the general discussion.

Umpire Pemberton told operators that he had been given positive assurance by executives of the major companies there would be no cut in the posted price of crude if producers worked out a curtailment plan and conformed rigidly with its provisions.

The gasoline price war that developed following dissolution of the Pacific Coast Petroleum Agency resulted in severe reductions in gasoline prices. Motor fuel in Los Angeles metropolitan area ranges all the way from 9 cents to 13½ cents including 4 cents tax. Premium and first grades are slightly higher. This critical situation and the fact that several operators have been overproducing since voiding of the code prompted Umpire Pemberton and Ralph Lloyd to call the general meeting held Friday. Chairman Lloyd of the Central Committee of California Oil Producers in charge of allocation, told those present at the meeting that "there is no need of hysteria regarding conditions in the oil industry. The demand is steady and the decline constant and there are no big new fields to flood the market."

Operators at the meeting voted unanimously to petition Congress to continue the import tax on crude and to enact legislation permitting voluntary agreements within the industry. This agreement, it was explained, was intended to cover producing, refining and marketing of petroleum. The meeting also resulted in the adoption of a resolution urging the state legislature to refrain from enacting a severance tax which would impose an additional tax of approximately $28,000,000 on the industry annually.

### Production Increase

Crude oil production in California, reflecting the increased allowable for June and overproduction of several operators in the Huntington Beach, Santa Fe Springs and Mountain View Fields, showed a substantial increase during the week. State production for the first four days of June indicates the general trend all during the week. On June 1 production totaled 526,677 bbls., reached 537,596 bbls. on June 2 and then bounded up to 554,161 bbls. on June 3 and 567,663 bbls. on June 4. The allowable for the month of June is 512,700 bbls. per day. Production in the early part of each month is always substantially above the prescribed allowable because operators in a number of fields chalk up their allowable as soon as possible and then shut down during the latter part of the month. This is particularly true of San Joaquin Valley fields where pumping wells are the rule.

**TANKER SHIPMENTS FROM LOS ANGELES TO DOMESTIC AND FOREIGN PORTS**

| Intercoastal-domestic— | May 26 Total this week | May 26 Daily average | May 19 Total last week | May 19 Daily average | This year to date | Same time last year |
|---|---|---|---|---|---|---|
| Fuel oil | ..... | ..... | ..... | ..... | ..... | 6,420,087 |
| Diesel and gas oil | ..... | ..... | ..... | ..... | 527,098 | 921,159 |
| Gasoline | 111,998 | 16,000 | 276,380 | 39,483 | 3,006,711 | 2,629,084 |
| Kerosene | 77,311 | 11,044 | ..... | ..... | 669,351 | 552,406 |
| Other finished oil | ..... | ..... | ..... | ..... | ..... | 15,171 |
| Foreign exports— | | | | | | |
| Crude oil | 173,185 | 24,741 | 392,241 | 56,034 | 4,527,587 | 3,271,960 |
| Fuel oil | 172,408 | 24,630 | 231,510 | 33,073 | 4,830,668 | 5,135,252 |
| Diesel and gas oil | 52,458 | 7,494 | 303,559 | 43,366 | 1,766,422 | 1,713,861 |
| Gasoline | 144,261 | 20,609 | 108,152 | 15,450 | 1,984,913 | 1,696,108 |
| Kerosene | ..... | ..... | 75,950 | 10,850 | 509,986 | 774,399 |
| Other finished oil | ..... | ..... | .. .. | ..... | ..... | 3,529 |
| Other unfinished oil | ..... | .. .. | ..... | ..... | 56,161 | 127,271 |
| Coastwise-domestic— | | | | | | |
| Crude oil | 75,926 | 10,846 | ..... | ..... | 2,299,867 | 4,145,760 |
| Fuel oil | 285,101 | 40,729 | 357,672 | 51,096 | 3,668,903 | 4,373,103 |
| Diesel and gas oil | 32,816 | 4,688 | 54,004 | 7,715 | 413,433 | 354,059 |
| Gasoline | 161,119 | 23,017 | 371,661 | 53,094 | 3,593,240 | 4,627,264 |
| Kerosene | ..... | ..... | 4,291 | 613 | 47,048 | 74,418 |

**TANKER SHIPMENTS FROM SAN FRANCISCO TO DOMESTIC AND FOREIGN PORTS**

| Intercoastal-domestic— | | | | | | |
|---|---|---|---|---|---|---|
| Fuel oil | ..... | ..... | ..... | ..... | ..... | 110,650 |
| Diesel and gas oil | ..... | ..... | ..... | ..... | 157,258 | 448,113 |
| Gasoline | ..... | ..... | .. .. | ..... | .. .... | 72,625 |
| Kerosene | ..... | ..... | ..... | ..... | 149,715 | 197,498 |
| Asphalt | ..... | ..... | 71,172 | 10,025 | 142,497 | ..... |
| Lubricants | ..... | ..... | 7,169 | 1,024 | 19,550 | 18,331 |
| Foreign exports— | | | | | | |
| Crude oil | 80,814 | 11,545 | 271,003 | 38,715 | 1,184,099 | 803,155 |
| Fuel oil | 81,828 | 11,690 | 108,305 | 15,472 | 775,588 | 691,431 |
| Diesel and gas oil | .. .. | ..... | 58,972 | 8,425 | 459,774 | 662,079 |
| Gasoline | 25,998 | 3,714 | 261,133 | 37,305 | 1,157,641 | 1,512,614 |
| Kerosene | ..... | ..... | 62,409 | 8,916 | 278,692 | 348,497 |
| Lubricants | ..... | ..... | 12,565 | 1,795 | 86,976 | 72,395 |
| Other finished oil | ..... | ..... | ..... | ..... | ..... | 2,760 |
| Other unfinished oil | ..... | ..... | ..... | ..... | ..... | 5,750 |
| Coastwise-domestic— | | | | | | |
| Fuel oil | 286,184 | 40,883 | 62,918 | 8,988 | 1,842,771 | 1,588,958 |
| Diesel and gas oil | 35,804 | 5,115 | ..... | ..... | 134,687 | 95,371 |
| Gasoline | 234,203 | 33,485 | 83,863 | 11,980 | 1,895,747 | 1,567,540 |
| Kerosene | 12,735 | 1,819 | ..... | ..... | 30,844 | 48,112 |

**IMPORTANT SOUTHERN CALIFORNIA WILDCATS**

| Company, well and location— | S. | T. | R. | Depth | Status— |
|---|---|---|---|---|---|
| Macrate, A. M., No. 1 Athens, Los Angeles Co. | 18- | 3- | 13 | 5,980 | pump 183 b.d. |
| Allen Bros., No. 1 Athens, Los Angeles Co. | 18- | 3- | 13 | .... | bldg. rig |
| Associated Oil Co., No. 4 Inglewood Deep, Los Angeles Co. | 7- | 2- | 14 | 1,471 | sd. sh. drlg. |
| Scientia Oil Co., No. 1 Inglewood Deep, Los Angeles Co. | 7- | 2- | 14 | 4,031 | sd. sh. drlg. |
| Standard Oil Co., No. 5 Inglewood Deep, Los Angeles Co. | 17- | 2- | 14 | 6,284 | suspended |
| Standard Oil Co., No. 6 Inglewood Deep, Los Angeles Co. | 17- | 2- | 14 | 4,180 | P.B. 4,060 |
| Shell Oil Co., No. 3 Inglewood Deep, Los Angeles Co. | 8- | 2- | 14 | 1,954 | sd. sh. drlg. |
| Ohio Oil Co., No. 17 Del Rey, Los Angeles Co. | 28- | 2- | 15 | 3,492 | cmtd. |
| Bel-Mar Oil Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 2,780 | suspended |
| Harper & Williams, No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 5,580 | sd. sh. drlg. |
| Coast Oil Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 6,695 | completing |
| Herndon Dev. Co., No. 1, Del Rey, Los Angeles Co. | 27- | 2- | 15 | .... | rigging up |
| Dabney Pet. Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | .... | bldg. rig |
| Ritelube Oil Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 7,048 | P.B. 6,975 ft |
| Mathews Pet. Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 6,210 | sd. sh. drlg. |
| Birch Royer Oil Co., No. 1 Del Rey, Los Angeles Co. | 34- | 2- | 15 | 6,281 | sd. sh. drlg. |
| Lor-Mar Oil Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 6,874 | flow 285 b.d. |
| Joyce Oil Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 6,690 | O.S. drlg. |
| Union Oil Co., No. 11 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 6,173 | flow 2,200 b.d. |
| Union Oil Co., No. 12 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 5,856 | cmtd. 5,856 |
| Union Oil Co., No. 13 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 750 | cmtd. 750 |
| Big Ben Oil Co., No. 1 Del Rey, Los Angeles Co. | 27- | 2- | 15 | 6,550 | flow 2,400 b.d. |
| Doyle Pet. Co., No. 1 Manhattan, Los Angeles Co. | 30- | 3- | 14 | 7,040 | dry, abd. |
| West American Oil Co., No. 1 Bandini, Los Angeles Co. | 17- | 2- | 12 | 1,164 | cmtd. 1,163 ft. |
| Western Gulf, No. 1 Bandini, Los Angeles Co. | 16- | 2- | 12 | 4,970 | sd. sh. drlg. |
| Vanco Dev. Co., No. 1 Artesia, Los Angeles Co. | 25- | 3- | 12 | 4,164 | sd. sh. drlg. |
| Monarch Oil Corp., No. 1 Topanga, Los Angeles Co. | 5- | 1- | 16 | .... | rig, suspended |
| The Texas Co., No. 1 Montebello, Los Angeles Co. | 5- | 2- | 11 | 3,960 | hd. sd. drlg. |
| Universal Consd., No. 2 Montebello, Los Angeles Co. | 5- | 2- | 11 | 5,945 | sd. sh. drlg. |
| Woodward Oil Co., No. 1 Montebello, Los Angeles Co. | 4- | 2- | 11 | .... | rigged up |
| Wilshire Oil Co., No. 1 Montebello, Los Angeles Co. | 5- | 2- | 11 | 2,781 | sd. sh. drlg. |
| Frontier Oil Co., No. 1 Pico, Los Angeles Co. | 7- | 2- | 11 | 2,600 | suspended |
| Pissell & Tull, No. 1 Puente Hills, Los Angeles Co. | 30- | 2- | 9 | 4,373 | hd. sd. drlg. |
| Barstow Oil Co., No. 1 Saugus, Los Angeles Co. | 35- | 5- | 16 | 4,040 | suspended |
| International Dev. Co., No. 1 Saugus, Los Angeles Co. | 34- | 5- | 16 | 4,335 | will P.B. |
| Piatt & Collins, No. 1 Costa Mesa, Orange Co. | 16- | 6- | 10 | 2,560 | suspended |
| Wilshire Oil Co., No. 1 Newport, Orange Co. | 29- | 6- | 10 | 871 | hd. sd. drlg. |
| Great American Pet. Co., No. 2 East Coyote, Orange Co. | 22- | 3- | 10 | 3,474 | pump water |
| Viking Oil Co., No. 1 Richfield, Orange Co. | 29- | 3- | 9 | 2,740 | hd. sd. drlg. |
| Great American Pet. Co., No. 4 Chino, San Bernardino Co. | 7- | 2- | 8 | 976 | hd. sd. drlg. |
| Shell Oil Co., No. 5 Capitan, Santa Barbara Co. | 5- | 4- | 30 | .... | bldg. rig |
| General Petroleum, No. 14 Capitan, Santa Barbara Co. | 32- | 5- | 30 | 2,720 | flow 110 b.d. |
| General Petroleum, No. 15 Capitan, Santa Barbara Co. | 32- | 5- | 30 | .. | rig, suspended |
| Freeman, M. J., No. 1 Purisima, Santa Barbara Co. | 11- | 7- | 33 | 816 | sd. sh. drlg. |
| Casmite Co., No. 1 Casmalia, Santa Barbara Co. | 13- | 9- | 35 | 1,745 | suspended |
| Scully & Snyder, No. 1 Naples, Santa Barbara Co. | 7- | 4- | 29 | 6,447 | suspended |
| Barnsdall-Rio Grande, No. 12 Elwood, Santa Barbara Co. | tideland | | | 3,518 | will dpn. |
| Barnsdall-Rio Grande, No. 3 Elwood, Santa Barbara Co. | 15- | 4- | 29 | 6,301 | rd. sh. drlg. |
| Bankline Oil Co., No. 8 Elwood, Santa Barbara Co. | tideland | | | 3,571 | Sespe form. |
| Signal Oil & Gas Co., No. 4 Elwood, Santa Barbara Co. | tideland | | | 2,281 | sd. sh. drlg. |
| Caroline Spandling, No. 10 Elwood, Santa Barbara Co. | tideland | | | 3,000 | hd. sh. drlg. |
| West Elwood Oil Co., No. 1 Goleta, Santa Barbara Co. | 9- | 4- | 28 | 3,715 | dry, abd. |
| Las Posas Pet., No. 1 Las Posas, Ventura Co. | 22- | 3- | 20 | 5,116 | fishing |
| Calco Pet. Co., No. 1 Las Posas, Ventura Co. | 17- | 3- | 20 | 1,352 | sd. sh. drlg. |
| Union Oil Co., No. 1 Bardsdale, Ventura Co. | 12- | 3- | 20 | 2,554 | sd. sh. drlg. |
| Dabney, H. K., No. 1 Bardsdale, Ventura Co. | 2- | 3- | 19 | 510 | rigging |
| Bankline Oil Co., No. 1 Sespe, Ventura Co. | 36- | 5- | 20 | .... | bldg. road |
| Oil Ridge Oil Co., No. 1 Ventura, Ventura Co. | 1- | 4- | 19 | 1,651 | sd. sh. drlg. |
| El Rancho Oil Co., No. 1 South Mountain, Ventura Co. | 9- | 3- | 19 | 1,113 | suspended |
| The Texas Co., No. 128 South Mountain, Ventura Co. | 4- | 3- | 09 | 8,863 | hd. sh. drlg. |
| Paloma Oil Co., No. 1 Susana, Ventura Co. | 12- | 2- | 18 | 1,065 | suspended |
| Bolsa Chica Oil Co., No. 2 Piru, Ventura Co. | 4- | 4- | 18 | 2,788 | cmtd. |
| High Mesa Oil Co., No. 1 Ojai, Ventura Co. | 16- | 4- | 22 | 675 | sd. sh. drlg. |
| Prop. Service Corp., No. 1 Lloyd, Ventura Co. | 24- | 3- | 22 | 7,772 | gr. sd. drlg. |
| Continental Oil Co., No. 4 San Miguelito, Ventura Co. | 33- | 3- | 24 | 4,662 | D.P. stuck |

### June Potentials

During the month of June, 1935, California operators will be allowed to produce 512,700 bbls. per day without violating the voluntary curtailment program. This is approximately 30,000 bbls. per day more than the allowable which prevailed during May under the N.R.A. Los Angeles Basin fields have been assigned an allowable of 243,500 bbls. per day, while the coastal fields have been given a daily quota of 59,500 bbls. San Joaquin Basin fields have an allowable of 209,700 bbls., which represents an increase of 4,458 bbls. daily. Los Angeles Basin Fields were given an increase of 10,961 bbls. and the coastal district 7,805 bbls. The June schedules give Huntington Beach an allowable of 42,300 bbls.; Long Beach, 63,500 bbls.; Playa Del Rey, 12,500 bbls.; Santa Fe Springs, 35,550 bbls.; Ventura Avenue, 28,860 bbls.; Kettleman North Dome, 59,700 bbls., and Mountain View, 14,800 bbls. per day. This represents an increase of 5,005 bbls. per day for Mountain View; 4,238 bbls. for Ventura Avenue, and 4,500 bbls. for Huntington Beach. Other fields were given appropriate increases depending upon their ability to produce and the amount of new production registered by new wells during the month.

During the first several days of June, several fields registered substantial increases due in some instances to overproduction. Mountain View, for instance, was producing 17,473 bbls. per day on June 1 but jumped to 21,203 bbls. on June 4. Huntington Beach, where one large operator resumed unrestricted production, increased from 43,339 bbls. on June 1 to 47,374 bbls. on June 4. Long Beach, strange as it may seem, actually showed a decline during the same period as production on June 1 was 75,017 bbls. and on June 1 it totaled 74,960 bbls. Santa Fe Springs rose from 39,800 bbls. on June 1 to 41,575 bbls. per day on June 4. Total state production increased from 526,677 bbls. on June 1 to 267,663 bbls. on June 4. Umpire Pemberton advised operators that, "regardless of your personal feelings toward the allotment assigned, I implore you not to be so stupid as to dispose of your crude oil at less than the market price because in so doing you are wilfully, deliberately and intentionally doing the only thing you can to depress prices. The price structure for crude oil can be held firm if all producers will take aggressive action toward any other producer whom they find selling oil at less than market price."

### Completions

The number of new wells completed during the current week were rather numerous and some of them showed substantial production. On the whole, however, the aggregate initial daily production was somewhat below expectations as new wells in the Playa Del Rey Field of Los Angeles Basin registered smaller initials. The numerical superiority over previous weeks more than made up for the deficiency as far as the average initial was concerned. It is interesting to note in this connection that aggressive development work in fields throughout the State has resulted in a larger completion list and this gain is particularly marked over the same period last year. A careful check of drilling operations

under way does not indicate the probability of an early decline in completions but rather reveals that we may anticipate a continuance of aggressive development and resulting completions during the next several months.

There were five new wells finished in the Playa Del Rey Field during the week, all of which were completed in the southeastern extension. The Union Oil Co. successfully finished No. 10 Vidor and this new producer, bottomed at 6,173 feet, was brought in flowing 2,198 bbls. of clean 22.3 gravity oil per day. Unless something unforeseen develops, the Union should have No. 9 Del Rey tanking oil within the next week. The Royalty Service Corp.'s No. 1 Pomac was good for 2,000 bbls. per day upon completion at 6,562 feet after the hole had been finished with a 4½-inch liner and a 6⅝-inch water string landed and cemented at 6,197 feet. The Big Bend Oil Co.'s No. 1 Palisades, bottomed at 6,820 feet after the hole had been redrilled due to an abnormal deviation from the vertical, was brought in flowing 2,380 bbls. of clean 23.1 gravity oil and 400,000 feet of natural gas per day. The Colly Oil Co.'s No. 1 Del Rey, bottomed at 6,529 feet, showed an initial daily production of 2,640 bbls. upon completion during the early part of the week. The Lor Mar Oil Co. completed its No. 1 Del Rey at 6,725 feet after plugging back the hole from 6,874 feet but this new well was only good for 290 bbls. per day on a compressor. During the next week or 10 days, the Big Ben's No. 2 Del Rey, Coast Oil Co.'s No. 1 Palisades, Charles W. Fourl's well No. 4, Joyce Oil Co.'s well No. 1, Thomas Kelly's well No. 1, Ed McAdams' well No. 2, and the Royalty Service Corp.'s No. 2 Del Rey should either be finished or in the process of being swabbed in as they are all nearing completion depths.

### Semi-Tropic

The Semi-Tropic gas field is rapidly becoming an important area from a drilling standpoint and present indications point toward considerable additional work in the immediate future. During the early part of the current week, the Fullerton Oil Co. successfully completed well No. 27 in Section 14-27-23 and well No. 76 No. 76 in Section 1-27-23. The former, bottomed at 2,463 feet and finished with an 8⅝-inch water string landed at 2,350 feet was brought in flowing 11,840,000 feet of dry natural gas per day while the latter, finished at 2,391 feet with an 8⅝-inch water string landed at 2,300 feet, showed an initial daily production of 17,680,000 feet of dry gas per day. Upon the completion of these two new wells, the company spudded in well No. 27 in Section 9-27-23 and well No. 72 in Section 26-27-23.

The Standard Oil Co. has assumed an aggressive policy in this field and every indication points to additional work during the next several weeks. The company is working on two drilling projects at present but has rigs going up for four more wells which are scheduled for immediate drilling. The Continental Oil Co. has pooled its acreage with holdings of the Milham Exploration Co. and the latter will take charge of drilling operations. Milham has already erected a rig for its first test in this field and preparations are under way to begin active drilling within the next 10 days. The Fullerton Oil Co. appears to be sitting pretty in this field due to its extensive holdings of fee acreage which were acquired several years ago. It is a little too early to classify the Semi-Tropic gas field as of primary importance due to the limited amount of drilling undertaken up to the present time. It is quite obvious of course that the Fullerton Oil Co.'s two new completions were finished under wraps and consequently may be good for a much higher allowable when opened up.

### Montebello

The eastern extension of the Montebello Field of Los Angeles Basin seems to be getting a little hotter and this area may bear watching during the next few weeks. The Texas Co.'s test is not yet deep enough to prove of any importance but the Universal Consolidated Oil Co.'s No. 2 Nutt has cored about 150 feet of what appears to be a very promising oil sand at 5,943 feet. This latter well is

(Continued on Page 144)

### IMPORTANT NORTHERN CALIFORNIA WILDCATS

| Company, well and location— | S. T. R. | Depth | Status— |
|---|---|---|---|
| Amerada Pet., No. 3 Blackwell Corner, Kern Co. | 17-26-11 | .... | rigging up |
| Standard Oil Co., No. 1 Lost Hills, Kern Co. | 2-26-20 | 4,143 | rig Hydril |
| Continental Oil Co., No. 1 McDonald, Kern Co. | 7-28-20 | 4,796 | sd. sh. drlg. |
| Belmac Drlg. Co., No. 1 McKittrick, Kern Co. | 22-29-21 | .... | grade |
| General Pet. Co., No. 1 South Belridge, Kern Co. | 30-28-21 | 11,377 | suspended |
| Standard Oil Co., No. 1-A North Belridge, Kern Co. | 36-27-20 | 8,618 | P.B. 8,385 |
| Standard Oil Co., No. 2 North Belridge, Kern Co. | 36-27-20 | 7,771 | hd. sh. drlg. |
| Belridge Oil Co., No. 32-35, North Belridge, Kern Co. | 35-27-20 | 5,450 | sd. sh. drlg. |
| Belridge Oil Co., No. 28-35, North Belridge, Kern Co. | 35-27-20 | 3,163 | sd. sh. drlg. |
| Union Oil Co., No. 19, North Belridge, Kern Co. | 36-27-20 | 1,024 | cmtd. |
| Union Oil Co., No. 20, North Belridge, Kern Co. | 36-27-20 | 1,095 | cmtd. |
| Cimarron Oil Corp., No. 1 Delano, Kern Co. | 14-25-27 | 2,198 | cleaning out |
| Standard Oil Co., No. 1 Delano, Kern Co. | 1-25-23 | 2,455 | gas, shut in |
| Standard Oil Co., No. 2 Delano, Kern Co. | 1-25-23 | 3,256 | wet, to P.B. |
| Standard Oil Co., No. 3 Delano, Kern Co. | 12-25-23 | 3,251 | sd. sh. drlg. |
| Standard Oil Co., No. 4 Delano, Kern Co. | 34-24-23 | .... | rigging up |
| Trico Oil & Gas Co., No. 1 Delano, Kern Co. | 3-25-23 | 2,525 | gas well |
| Trico Oil & Gas Co., No. 3 Delano, Kern Co. | 36-24-22 | 4,835 | P.B. 2,223 ft |
| Trico Oil & Gas Co., No. 4 Delano, Kern Co. | 3-25-23 | 3,320 | sd. sh. drlg. |
| Baker, Cliff, No. 1 Pozo Creek, Kern Co. | 33-27-28 | .... | rigging up |
| Associated, No. 2 Kern Front, Kern Co. | 4-28-27 | 2,547 | cmtd. 2,499 ft. |
| Kern River Oilfields, No. 3 Kern Front, Kern Co. | 25-28-27 | 380 | sd. sh. drlg. |
| Deep Zone Oil Co., No. 1 Kern Front, Kern Co. | 29-28-27 | .... | bldg. rig |
| Republic Petroleum, No. 1 Kern Front, Kern Co. | 24-28-27 | 1,981 | sd. sh. drlg. |
| Pongratz Oil Co., No. 1 McVan Area, Kern Co. | 2-27-27 | 1,361 | sd. sh. drlg. |
| Golden Bear Oil Co., No. 1 Kern Front, Kern Co. | 32-27-27 | 5,515 | gr. sd. drlg. |
| Stevens Pet. Co., No. 1 Kern Front, Kern Co. | 13-27-27 | 2,452 | sd. sh. drlg. |
| Barnsdall Oil Co., No. 4 Mountain View, Kern Co. | 32-30-29 | 2,640 | sd. sh. drlg. |
| Hancock Oil Co., No. 6 Mountain View, Kern Co. | 14-30-28 | 5,349 | flow, 4,000 b.d. |
| Hancock Oil Co., No. 7 Mountain View, Kern Co. | 14-30-28 | 3,053 | sd. sh. drlg. |
| Shell Oil Co., No. 2 Mountain View, Kern Co. | 32-30-29 | 3,581 | sd. sh. drlg. |
| C. C. M. Oil Co., No. 1 Mountain View, Kern Co. | 11-30-28 | 4,681 | sd. sh. drlg. |
| Union Oil Co., No. 6 Mountain View, Kern Co. | 9-30-28 | 8,019 | dry, abd. |
| Union Oil Co., No. 7 Mountain View, Kern Co. | 15-30-28 | 5,596 | completing |
| Union Oil Co., No. 8 Mountain View, Kern Co. | 23-30-28 | 4,980 | sd. sh. drlg. |
| General Petroleum, No. 4 Mountain View, Kern Co. | 14-30-28 | 5,628 | O.S. cmtd. |
| Vesta Pet. Co., No. 1 Mountain View, Kern Co. | 19-30-29 | 4,651 | sd. sh. drlg. |
| Mohawk Oil Co., No. 10 Mountain View, Kern Co. | 30-30-29 | 5,171 | sd. sh. drlg. |
| Mohawk Oil Co., No. 11 Mountain View, Kern Co. | 30-30-29 | 1,996 | sd. sh. drlg. |
| Sovereign Oil Co., No. 4 Mountain View, Kern Co. | 30-30-29 | 5,631 | sd. sh. drlg. |
| Jergins Trust, No. 6 Mountain View, Kern Co. | 30-30-29 | 5,260 | sd. sh. drlg. |
| Standard Oil Co., No. 7 Mountain View, Kern Co. | 13-30-28 | 5,173 | cmtd. |
| Standard Oil Co., No. 8 Mountain View, Kern Co. | 23-30-28 | .... | rig, suspended |
| Star Petroleum, No. 1 Mountain View, Kern Co. | 23-30-28 | 5,516 | suspended |
| Ohio Oil Co., No. 1 Mountain View, Kern Co. | 33-30-29 | 5,990 | suspended |
| Ohio Oil Co., No. 2 Mountain View, Kern Co. | 33-30-29 | 4,752 | sd. sh. drlg. |
| Mountain View Oil Co., No. 1 Mountain View, Kern Co. | 25-30-28 | 5,650 | cleaning out |
| Jergins Trust, No. 6 Edison, Kern Co. | 24-30-29 | 1,727 | P.B. 1,315 |
| Jergins Trust, No. 7 Edison, Kern Co. | 13-30-29 | 1,285 | cmtd. |
| Jergins Trust, No. 8 Edison, Kern Co. | 24-30-29 | .... | rigging up |
| Shell Oil Co., No. 6 Edison, Kern Co. | 14-30-29 | 2,980 | cmtd. 2,727 |
| Shell Oil Co., No. 7 Edison, Kern Co. | 14-30-29 | 2,979 | pump 130 b.d. |
| Shell Oil Co., No. 8 Edison, Kern Co. | 14-30-29 | .... | location |
| Chaulk Oil Co., No. 1 Edison, Kern Co. | 5-30-29 | 3,855 | bailing |
| Nelco Oil Co., No. 1 Edison, Kern Co. | 5-30-29 | 3,018 | suspended |
| North American, No. 3 Edison, Kern Co. | 14-30-29 | .... | rig, suspended |
| General Pet., No. 5 Edison, Kern Co. | 15-30-29 | 3,460 | form. test |
| Appling, C. E., No. 1 Edison, Kern Co. | 4-30-29 | 3,186 | hd. sd. drlg. |
| Goldman, Frank, No. 1 Edison, Kern Co. | 30-29-30 | 963 | hd. sd. drlg. |
| Woodward Oil Co., No. 3 Edison, Kern Co. | 36-29-29 | 685 | sd. sh. drlg. |
| Woodward Oil Co., No. 4 Edison, Kern Co. | 36-29-29 | 460 | O.S. drlg. |
| Woodward Oil Co., No. 5 Edison, Kern Co. | 36-29-29 | 597 | sd. sh. drlg. |
| Lucas, Don, No. 1 Edison, Kern Co. | 26-29-29 | 375 | sd. sh. drlg. |
| General Pet., No. 1 Arvin, Kern Co. | 1-32-29 | 4,474 | hd. sd. drlg. |
| Hall-Baker Co., No. 1 Arvin, Kern Co. | 16-31-30 | 1,250 | pump water |
| Hall-Baker Co., No. 3 Arvin, Kern Co. | 21-31-30 | .... | location |
| Hutcheson & Osborne, No. 1 Arvin, Kern Co. | 32-30-30 | .... | rigged up |
| Sea Cliff Oil Co., No. 1 Greenfield, Kern Co. | 7-31-28 | 6,670 | sd. sh. drlg. |
| Fullerton Oil Co., No. 1 Semi-Tropic, Kern Co. | 1-27-22 | 2,391 | gas well |
| Fullerton Oil Co., No. 2 Semi-Tropic, Kern Co. | 14-27-23 | 2,463 | gas well |
| Fullerton Oil oC., No. 3 Semi-Tropic, Kern Co. | 9-27-23 | 480 | sd. sh. drlg. |
| Fullerton Oil Co., No. 4 Semi-Tropic, Kern Co. | 26-27-23 | 429 | sd. sh. drlg. |
| Standard Oil Co., No. 1 Semi-Tropic, Kern Co. | 8-27-23 | 3,200 | producing gas |
| Standard Oil Co., No. 2 Semi-Tropic, Kern Co. | 5-27-23 | 3,153 | sd. sh. drlg. |
| Standard Oil Co., No. 3 Semi-Tropic, Kern Co. | 7-27-23 | 481 | sd. sh. drlg. |
| Standard Oil Co., No. 4 Semi-Tropic, Kern Co. | 9-27-23 | .... | bldg. rig |
| Standard Oil Co., No. 5 Semi-Tropic, Kern Co. | 9-27-23 | .... | bldg. rig |
| Standard Oil Co., No. 6 Semi-Tropic, Kern Co. | 8-27-23 | .... | location |
| Standard Oil Co., No. 7 Semi-Tropic, Kern Co. | 1-27-22 | .... | bldg. rig |
| Milham Expl. Co., No. 1 Semi-Tropic, Kern Co. | 15-27-23 | .... | rig, suspended |
| Shell Oil Co., No. 1 Buena Vista, Kern Co. | 9-32-25 | 6,575 | sd. sh. drlg. |
| Bender, E. L., No. 1 Temblor, Kern Co. | 2-29-20 | 975 | sd. sh. drlg. |
| Reserve Oil & Gas Co., No. 1 Tejon, Kern Co. | 2-10-19 | 2,699 | recmtd. 2,644 |
| Reserve Oil & Gas Co., No. 3 Tejon, Kern Co. | 12-10-19 | .... | rig skd fr No. 2 |
| Silver Gate Oil Co., No. 1 Tejon, Kern Co. | 7-10-19 | 551 | sd. sh. drlg. |
| Taft Well Drlg. Co., No. 1 Kreyenhagen, Fresno Co. | 33-22-16 | 2,097 | sd. sh. drlg. |
| Standard Oil Co., No. 1 Coalinga, Fresno Co. | 13-20-14 | 525 | O.S. drlg. |
| Wellington Oil Co., No. 1 Coalinga, Fresno Co. | 14-20-14 | 1,170 | hd. sd. drlg. |
| Milham Expl. Co., No. 1 Ora Loma, Fresno Co. | 12-12-11 | 5,850 | dry, abd. |
| Union Oil Co., No. 1 Lillis-Kettleman, Fresno Co. | 24-21-16 | 10,944 | redrlg. 8,455 |
| K. N. D. A., No. 56, Kettleman, Kings Co | 8-22-18 | 10,249 | reaming |
| Standard, No. 2 Kettleman Middle, Kings Co. | 29-23-19 | 6,520 | fish bit |
| Continental Oil Co., No. 1 Kettleman-South, Kern Co. | 7-25-20 | 6,395 | hd. sd. drlg. |
| Farrel Pet., well No. 1, San Luis Obispo Co. | 18-31-12 | 1,677 | sd. sh. drlg. |
| Willett Oil Co., No. 1 Cholame, San Luis Obispo Co. | 10-25-15 | 3,587 | suspended |
| Kings River Oil Pool, well No. 1, Tulare Co. | 29-16-23 | 3,265 | will redrl. |
| Schuster, C. R., No. 1 Tulare, Tulare Co. | 27-22-23 | .... | rig, suspended |
| Commonwealth Consd. Gas Co., No. 1 Tulare Lake, Kings | 21-22-20 | 2,490 | gas well |
| Commonwealth Consd. Gas Co., No. 2 Tulare Lake, Kings | 21-22-20 | 604 | sd. sh. drlg. |
| Amerada Pet., No. 1 F.L.D., San Joaquin Co. | 15- 2- 5 | 5,696 | hd. sh. drlg. |
| Pure Oil Co., No. 1 Chowchilla, Madera Co. | 7-10-14 | 8,402 | gas well, idle |
| Northern Counties Pet, No. 1 Tehama, Tehama Co | 25-24- 3 | 4,152 | hd. sh. drlg. |
| The Texas Co., No. 1 Petrolia, Humboldt Co. | 1- 3- 2 | 6,061 | sd. sh. drlg. |
| Shell Oil Co., No. 1 Branch, Monterey Co. | 34-24-10 | 2,264 | sd. sh. drlg. |

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# TECHNICAL QUESTIONS ANSWERED

By Charles K. Francis, Ph. D., Technical Editor

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to sumbit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible.

Inquiries must be signed but only the given initials will be printed. The source of the question is considered to be confidential.

Questions requiring a discussion of patents, the use of intricate formulas, extended computations, or cost estimates cannot be considered.

When the matter is of general interest the reply will be published within a reasonable time.

## Polymerization Means Building Up of Structure

**A new process has been proposed to me which it is claimed will make wax-free high grade lubricating oils from non-lubricating oils by an operation called polymerization. Do you know anything about such a process or its merits?—C. O. L.**

The reports relating to the recent developments within the manufacturing branch of the petroleum industry contain many references to polymerization. This operation is probably receiving at this time more attention and study than did cracking 20 years ago. It is a change in structure, known to the chemist for many years, just the opposite to cracking. Cracking operates on a heavy liquid, such as gas oil, to produce the light liquid gasoline, but the polymerizing of a liquid usually involves changing a light liquid, sometimes a gas, into a heavier liquid or a solid. The cracking process tears a substance apart, makes more smaller molecules out of a large one, while the process of polymerization builds up, makes a large molecule from small ones.

The best known example of polymerization is the change of formaldehyde, HCHO, a gas, to paraformaldehyde $(HCHO)_2$, a white solid. The chemist explains these formulas by saying that the substances contain the same percentage of hydrogen, carbon and oxygen, but the second, which is called a polymer, weighs twice that of the first. Another way of explaining such a change is that a new compound is produced, having the same relative composition as the original, by the union of two molecules of the first. This sort of combination is not the kind that always takes place with petroleum molecules. Identical groups do not readily combine to make a large one but probably a number of different small ones do.

Pure polymerization is unlike cracking in another respect. A cracked product is formed with loss of weight, because of gas formation and the separation of carbon, but in the preparation of a true polymer, the weight after polymerization is the same as before.

The fundamental change of a light oil having very little viscosity to a heavy oil with high viscosity required to make a high grade lubricant from a nonlubricating stock would without doubt be polymerization. The conditions favorable to polymerization are the same as for cracking; that is, heat, pressure and time. We know this from the facts obtained in the preparation of various chemical compounds. Pressure seems to be more important than in cracking; while temperatures may vary over a wide range. Catalysts have a more important place than in the several processes now in use for the cracking of petroleum.

One of the most interesting and important of the polymerizing processes is that employed for the synthetic preparation of rubber. There are several of these known, differing largely in the temperature treatment and in the catalyst. Isoprene is heated in one for several days under mild pressure at a relatively low temperature about 200° F. and in another at a much higher temperature, about 480° F., to make butadiene, a rubbery mass. One of the important patents mentions a pressure of 300 pounds. The large scale operation for the production of synthetic rubber was during the World War, when 150 tons per month is reported to have been made.

The conversion of low grade lubricating oil to oil of a superior grade has been practiced in Europe for some years. In this process the thickening of the oil is accomplished by means of a silent electrical discharge.

## Vapors From Petroleum Liquids Not Considered as Poisons

**What gases given off from crude oil and petroleum liquids are classified as poisons? If you have any information what amounts of these in the air are considered to be dangerous the details would be appreciated. —S. O. G.**

A poison is any substance which when introduced into the system of an animal or human being, because of some chemical reaction it develops in the body-fluids, results in damaging one or more vital organs and may cause death. Foreign substances introduced into the system may cause death chiefly because they reduce the normal supply of air, as water in the case of drowning and certain gases that produce asphyxiation, but these are not poisons.

The vapors and gases of the paraffin hydrocarbons, the compounds present in the normal petroleum, are not poisons. Inhalation of the volatile hydrocarbons that may be evolved from fresh crude oil, or during the primary distillation, or from cracking stills and other refining operations may cause anaesthesia, but if the person still alive is removed to fresh air he soon recovers without experiencing any harmful after effects. Prolonged breathing of these vapors cause death through asphyxiation, the action being similar to that of drowning. Persons overcome by hydrocarbon gases may be resuscitated by the same methods used in cases of drowning.

Most cases of fatal poisoning from petroleum gases have been due to hydrogen sulphide. This is a truly dangerous gas causing changes in the blood, whereas the hydrocarbons do not enter into a chemical combination with any part of the body. Hydrogen sulphide is present in only a few oils in dangerous quantities; in some natural gas and in refinery gas.

A petroleum product must contain one or more volatile constituents to be classed as a possible source of an anaesthetic, therefore only the lighter oils are considered dangerous in this respect. The U. S. Bureau of Mines reported a series of experiments in Technical Paper 348, by Katz and Bloomfield, Gas Masks for Gasoline and Petroleum Vapors, 1924, in which gasoline was used as the source of hydrocarbon vapors. It was demonstrated that the odor of gasoline may be detected in inhaled air containing 0.03 per cent gasoline; 0.28 per cent caused a man to become dizzy after 14.5 minutes' exposure; concentrations of 1.13 to 2.22 per cent caused dizziness in 3 minutes; 2.22 increasing to 2.60 per cent caused a man to become dizzy after only 10 to 12 breaths. Haggard reports tests with dogs, where gasoline vapor was gradually added to pure air. Convulsions occurred when 1 per cent of gasoline was attained after exposure of 12 to 35 minutes. Anaesthesia resulted after a total of 28 minutes when a concentration of 2.3 per cent had been reached, with death following four minutes later, with a final concentration of 2.6 per cent.

## Definition of Naphtha Involves Distilling Points

**We have had a question raised as to the exact meaning of naphtha and it will be a favor if you will give us a reliable definition for this product. Is gasoline a naphtha?—L. E. C.**

Considering gasoline as the first fraction derived from the distillation of a suitable crude oil, naphtha is the second fraction. The only official definition of naphtha is that of the American Society for Testing Materials, which is:

Petroleum naphtha—A generic term applied to refined, partly refined or unrefined petroleum products and liquid products of natural gas, not less than 10 per cent of which distills below 347° F. (175° C.) and not less than 95 per cent of which distills below 464° F. (240° C.), when subjected to distillation in accordance with the standard method of test for distillation of gasoline, naphtha, kerosene and similar petroleum products (A.S.T.M. Designation: D86) of the American Society for Testing Materials.

Note—The "naphthas" used for specific purposes such as cleaning, manufacture of rubber, manufacture of paints and varnishes, etc., are made to conform to specifications which may require products of considerably greater volatility than that set by the limits of this generic definition.

Gasoline is, according to the same authority, a refined petroleum naphtha which by its composition is suitable for use as a carburant in internal combustion engines.

## Grading of Greases Founded on Consistency Measurements

**What can you tell me about the consistency series of greases and how the position of a grease on this series is determined? Lubrication specifications for a particular machine will often call for a grease of about No. 2 consistency. This means little to me and I have been unable to obtain information on a definite consistency series.—D. C.**

The consistency of grease is determined by measuring the penetration under specified conditions by means of an asphalt penetrometer. The details of the apparatus and method are described in the Tentative Standard A.S.T.M. D 217-33T. The asphalt penetrometer is modified by replacing the needle used in the asphalt penetration test with a special cone. A part of the A.S.T.M. procedure is quoted:

"The can of grease or petrolatum shall be placed on the penetrometer table and the cone lowered until the tip just touches the surface. Watching the shadow of the tip aids in accurately setting the cone. The scale shall then be set to zero and the plunger released suddenly and kept released for five seconds. The penetration is read from the scale, the units being tenths of a millimeter.

"In making tests, the total surface area disturbed by the test has a diameter about equal to the measured depth of penetration. In order to prevent one test from being affected by another disturbed area or by sides of the can, in starting a test the tip shall never be placed closer to the sides of the can or the edge of a previous hole than the penetration distance of that particular grease or petrolatum. The grease or petrolatum shall not be smoothed over for further tests.

"Five tests shall be made on each sample and the average reported as the penetration, if the mean deviation of these readings does not exceed 3 per cent. If the mean deviation does exceed 3 per cent, the average of 10 readings shall be reported as the penetration of the sample. More than one 1-pound can will be needed for the required number of tests on the softer greases or petrolatums."

Klemgard, in Lubricating Greases, mentions the Abraham consistometer, with reference to investigations reported by D. R. Merrill, who gives the consistencies for a series of cup greases as shown in the table.

**GRADING OF GREASE**
(Abraham)

| Grade | Consistency at 77°F. | Soap content |
|---|---|---|
| 0 | 2.0 | 10.5 |
| 1 | 3.3 | 11 5 |
| 2 | 4.5 | 14 5 |
| 3 | 6 5 | 17 5 |
| 4 | 8.5 | 20.0 |
| 5 | 11.0 | 22 5 |
| 6 | 16.5 | 29.0 |

The A.S.T.M. consistencies for cup greases are given in the table.

**GRADES OF CUP GREASES**
(A.S.T.M.)

| Grade | Penetration m.m. |
|---|---|
| 0 | 350 |
| 1 | 300 |
| 2 | 250 |
| 3 | 200 |
| 4 | 175 |
| 5 | 125 |
| 6 | 100 |

References: Klemgard, Lubricating Greases, pages 57-62; Merrill, Ind. Eng. Chem. 17, 1,068, 1925; A.S.T.M. Standards on Petroleum Products and Lubricants, September, 1934, pages 221-226.

# PERSONAL PARAGRAPHS

AMOS L. BEATY, general counsel of the Phillips Petroleum Company, was a recent visitor to Washington, D. C.

• • •

ED GRISWOLD, petroleum engineer, Continental Oil Company, Fort Worth, Tex., was in West Texas last week on company business.

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JOSE SANCHEZ, representative of various American manufacturing interests in Argentina, is now in New York City for an extended visit.

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CHARLES F. ROESER, of Roeser & Pendleton, Fort Worth, Tex., spent several days in Washington, D. C., on business for his company.

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JOHN M. CRAWFORD, chairman of the board of Parkersburg Rig & Reel Company, and MRS. CRAWFORD, are now on a European trip.

• • •

C. B. AMES, president of the Texas Company, was in Washington, D. C., recently on business with the Planning and Coordination Committee, of which he is a member.

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R. S. DICKIE, director of South African Tordanite Mining & Refining Company, is en route to South Africa following a visit to the London, England, headquarters of the company.

• • •

J. S. COSDEN, president of the Cosden Oil Corporation, Fort Worth, Tex., is on a three weeks' business trip to New York and Chicago. He expects to return to Fort Worth the latter part of this week.

• • •

C. G. EZELL, of Houston, Tex., was a recent visitor in Los Angeles, Calif.

• • •

E. DEMERS, of Skiff, Alberta, has resumed work on the British-American refinery staff at Coutts, Alberta.

• • •

BILL EYSSEN, independent operator of Abilene, Tex., announces the arrival of an 8-pound boy at his home.

• • •

RALPH STEINMAN, chief scout for the Sinclair Prairie Oil Company, Tulsa, is confined at his home by illness.

• • •

R. H. ALAGOOD, geologist for the Amerada Petroleum Corporation, has been transferred from Norman, Okla., to Midland, Tex.

• • •

J. N. GALLAGHER, manager of oil sales for George B. Limbert & Company, of Chicago, is visiting among Mid-Continent refiners.

• • •

W. B. ROYER, land man for the Tide Water Oil Company at Houston, Tex., is recovering from a minor operation performed the past week.

• • •

FRANK DRANE, head of the Drane Tank Company which has just moved its offices to Fort Worth, is spending most of his time in the West Texas district.

• • •

B. C. DeVIDO, independent lease man of New Mexico, has moved his offices to Fort Worth, Tex. His former headquarters were at Santa Fe and Roswell.

• • •

CARL S. McFARLANE, well known as a driller in the Oklahoma and Texas fields, is handling a drilling contract for the Tenwell Gas & Oil Company, near Vermilion, Alberta.

DR. HENRY M. TORY, president of the National Research Council of Canada since 1923, has retired on completion of his term, being succeeded by MAJ.-GEN. A. G. L. McNAUGHTON.

• • •

AT THE commencement of the University of Pittsburgh on June 5, the honorary degree of Doctor of Science was conferred on WILLIAM A. HAMOR, assistant director of Mellon Institute of Industrial Research.

• • •

F. R. COATES, vice president of Cities Service Refining Company, New York City, spent several days in Washington, D. C., attending to business with the Planning and Coordination Committee and the Refinery Subcommittee.

• • •

CARL A. YOUNG, secretary, Division of Production, American Petroleum Institute, Dallas, Tex., is in Pittsburgh, Pa., attending the eastern district meeting and will visit the New York City office of the Institute before returning to Dallas.

• • •

J. GORDON HEWITT was in New York last week en route to Argentina where he will be connected with the Standard Oil Company of Argentina. He has been with the Standard Oil Company of Louisiana with headquarters at New Orleans, La.

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H. C. HANNA, vice president of the Standard Oil Company, and manager of the El Segundo, Calif., refinery of the company, acquired a son-in-law on June 7 when his daughter was married to HECTOR M. DYER, former track star of Stanford University.

JAMES HAMILL, of the Texas Company's paleontological department, recently announced the arrival of his first heiress, Mary Lee.

• • •

E. O. BENNETT, vice president in charge of production for Continental Oil Company, Ponca City, Okla., was a Houston, Tex., visitor last week.

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E. J. NICKLOS, independent operator, Ponca City, Okla., flew to his home from Houston, Tex., last Friday to recuperate after a week's sickness with influenza and laryngitis.

• • •

J. B. SCHUYLER, vice president of the Baash-Ross Tool Company, was the guest last week of T. E. WARD, export manager for the company, with headquarters in New York City.

• • •

DR. EUGENE A. STEPHENSON, secretary-treasurer, Petroleum Division, A.I.M.E., Rolla, Mo., has been in the Texas Gulf Coast and East Texas areas on consulting work for some time past.

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W. T. HOLLIDAY, president of the Standard Oil Company of Ohio, Cleveland, Ohio, was in Washington, D. C., on business and to attend the meetings of the Planning and Coordination Committee.

• • •

FRANK CHAMPION, sales manager of Byron Jackson Company, stopped off in Tulsa on his return from a European trip where he visited all the principal European oil-producing centers in the interest of his company. He is returning to Los Angeles, Calif., by way of the Mid-Continent Field.

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SAM B. GRAY, Hammond & Gray Tank Company, Longview, Tex., was a visitor to Houston, Tex., last week on business.

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M. F. BRIDGES, purchasing agent, Tide Water Oil Company, Tulsa, was in Houston, Tex., recently on company business.

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H. J. MORLANG, Dallas, Tex., vice president in charge of tubular sales, Oil Well Supply Company, spent several days in Tulsa recently.

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J. R. GAHAN, vice president of the Tide Water Oil Company, with headquarters at Houston, Tex., was a business visitor to Dallas, Tex., the past week.

• • •

F. W. COVAULT, district superintendent, Amerada Petroleum Corporation, Fort Worth, Tex., was in New Mexico and West Texas last week looking after company business.

• • •

CHESTER WASHBURNE, geologist, of New York, has been spending the past week in the Panhandle district of Texas. Mr. Washburne was formerly with the U. S. Geological Survey.

• • •

JOHN JACO, district superintendent for the Stanolind Pipe Line Company, has moved from Devol, Okla., to Electra, Tex. The company is moving its North Texas and southern Oklahoma headquarters to Electra.

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E. H. SALRIN, vice president; W. F. BOWMAN, district geologist, both with Tide Water Oil Company at Houston, Tex., and L. C. DECIUS, chief geologist for the Associated Oil Company, made a business trip through Coastal Louisiana the past week.

## DO YOU REMEMBER?

From The Oil and Gas Journal Files

### 25 Years Ago

June 13, 1910

About $10,000,000 of English money has been invested in California oil properties and undeveloped acreage and the California public is unaware who is supplying the money. The current opinion is uppermost that it is Rothschild money. It is said that $15,000,000 more of English capital awaits investment in California's oil industry.

The Hidalgo Oil Co., headed by Capt. J. F. Lucey, has been formed to exploit 14,000 acres in the Ebano district, Mexico. C. H. and A. D. Thompson, and M. A. Spellacy and others are associated with Captain Lucey.

The Lakeview gusher in California is still flowing wild after 92 days during which it is estimated it has produced 4,000,000 bbls. of oil.

### 20 Years Ago

June 13, 1915

Fred T. Manley has been appointed assistant manager of the Texas Co.'s big refinery near Houston and will move from Port Arthur to Houston.

Jesse K. Starr, age 73, dies in Fredonia, N. Y. His father owned the first commercially-used gas well in the world. It was located in Fredonia and as early as 1821 supplied gas for illuminating purposes in that village.

E. W. Sinclair and E. Rogers Kemp, of Tulsa, are in Cuba looking over a big sugar producing property. They are contemplating an investment in the sugar business now that the bounty on sugar has been removed.

### 10 Years Ago

June 11, 1925

South Penn Oil Co. purchases the extensive Bradford Field holdings of the Hazelwood Oil Co. S. R. Barcroft, superintendent for Hazelwood, who entered the oil business soon after the Drake well discovery, will retire.

S. C. Lowe, of Houston, Tex., gas and petroleum engineer, dies of a heart attack. He was a brother of Leon P. Lowe, president of the Pacific Gas & Electric Co. in California.

The management of the Shreveport division of the Amerada Petroleum Corp. has been transferred from Houston, Tex., to Tulsa.

In the month of May, 2,357 wells were completed in the fields east of California and at the close of the month there were 1,114 rigs up and 4,258 wells drilling, a total of 5,372 operations.

FRANK I. BRINEGAR, assistant to the president of the Continental Supply Company for the past two years, has been promoted to vice president of that organization, with headquarters at Dallas, Tex.

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STUART MOSSOM, geologist for the Magnolia Petroleum Company at San Antonio, Tex., and MISS PATTY LACY of the same city, were married recently and are spending their honeymoon in Colorado.

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CHARLES NEHER, representative of the Templeton, Kenly Company, Ltd., Chicago, is leaving shortly for a trip through Kansas, Oklahoma, Texas and Louisiana, after which he will make his headquarters in the Southwest to contact the trade regularly.

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A. W. EVERETT has been promoted to manager of the southwestern district of the Sherwin-Williams Company with headquarters at Kansas City, Mo. Mr. Everett was connected with the Tulsa branch for 12 years, first as assistant manager and later manager. E. J. GEBHART, of Kansas City, succeeds Mr. Everett as manager of the Tulsa branch.

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R. E. HICKEN has resigned as director of Franco Oils, Ltd., of Cardston, Alberta. Mr. Hicken, who has been principal of the Cardston High School for several years, is leaving for Salt Lake City, Utah, to continue university work. DR. H. H. HINTZE, of Salt Lake City, chief geologist for the company, has been elected to succeed Mr. Hicken as director.

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JOHN E. SHATFORD, national co-ordinator of refinery operations under the oil code, spent several days in New York on personal business.

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WILLIAM BRAYBROOK, of the International Petroleum Company staff in Peru, has returned to Petrolia, Ontario, to spend a two months' vacation in Canada. Mr. Braybrook has just completed his fourth three-year contract with the International company. He will return to Negritos late in July.

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I. M. KRASNOPOLSKY, mining and metallurgical engineer of the Department of Rare Metals, Commissariat of Heavy Industries, U.S.S.R., is in the United States for four months on an inspection trip, visiting the mining and metallurgical operations of some of the companies producing the uncommon metals.

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R. G. COCANOWER, general manager of the Olney Oil & Refining Company, left Wichita Falls, Tex., for Chicago, to attend the meeting of the Group 2 Stabilization Committee. He returned recently from a previous trip to Chicago, stopping in Indianapolis, Ind., to see the races. Both trips are for about 10 days.

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EDWARD L. RYERSON, JR., president of Joseph T. Ryerson & Son, Inc., was recently elected to the board of directors of the New York Life Insurance Company. Mr. Ryerson is also a director of the Northern Trust Company of Chicago, Quaker Oats Company, a trustee of the University of Chicago, and president of the United Community Fund of Chicago, Inc.

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R. A. SPERRY, vice president of General Petroleum Corporation; A. H. BELL, of Continental Oil Company; N. A. ROUSSELOT, of Milham Exploration Company; F. E. REHM, of Shell Oil Company; CARL H. BEAL, of Belmont Investment Company; L. C. DECIUS, of Associated Oil Company; R. F. LYTLE, of Petroleum Securities, and L. A. CRANSON, of Kettleman Oil Corporation, were elected directors of the Kettleman North Dome Association at the annual meeting.

## With the Texas Company 32 Years

L. R. Holmes, vice president and manager of the refining department of the Texas Company (California), was born in Pennsylvania July 22, 1882. He attended school in Olean, N. Y., and he found employment during the summer vacations at the Olean refinery of the Vacuum Oil Company and the Acme refinery of the Standard Oil Company. On May 19, 1903, he entered the service of the Texas Company at the Port Arthur works, Port Arthur, Tex., and has served the company continuously throughout the 32 years since that date. His entire period of service has been in the refining department, his earlier positions of responsibility being superintendent of the Port Arthur terminal and general superintendent of the terminal division.

L. R. HOLMES

On February 1, 1923, Mr. Holmes was appointed assistant manager of the refining department, and in 1928, when the Texas Company absorbed the California Petroleum Corporation, he was sent to California as vice president and manager of the refining department. He remained there until May, 1930, when he returned to New York as manager of the refining department, also as an officer and director of various subsidiary companies, including the position of president of Texaco Salt Products Company. On November 1, 1933, he again was made vice president and manager of the refining department of the Texas Company (California).

J. W. MALSEED, manager of the marine department of the Shell Oil Company at Los Angeles Harbor, has been elected chairman of the Bilge Club which is composed of executives engaged in the marine industry in Los Angeles, Calif., and the harbor district.

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E. W. LANGDON, manager of the reinforcing bar division of Joseph T. Ryerson & Son, Inc., was recently elected president of the Concrete Reinforcing Steel Institute which includes all mills selling new billet stock, and rail steel, also jobbers and distributors of reinforcing materials.

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G. L. ARMSTRONG, an employe of the Union Oil Company for the past 35 years, was tendered a banquet Saturday night by company executives and Ventura County, California, employes, and was officially welcomed to the Union's "35 year club," by W. W. ORCUTT, vice president, and F. F. HILL, director of production.

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ERNEST SIDWELL, until recently manager in charge of the Sinclair-Wyoming Oil Company's operations in the Salt Creek Field, Natrona County, Wyoming, has accepted a position as general manager of the Norbla Oil Company, Tulsa. The Norbla company, headed by C. B. PETERS, of Tulsa, has its principal properties in Osage County, Oklahoma.

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JERRY E. STILLWELL, assistant to CARL A. YOUNG, American Petroleum Institute, Dallas, Tex., has a gadget that looks like a modern television radio set in his new office in the Gulf States Building, that he claims is an air conditioning control box but it is rumored he got several local radio stations on it since he moved into the new offices early this month.

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H. LINN, of the Linn Tractor Company, Morris, N. Y., flew to Houston, Tex., the first of the past week. In company with JIM CUMMINGS, of Crutcher, Rolfs & Cummings, of Houston, and HOBSON C. DUNN, pipe line contractor, who was picked up at Dallas, Tex., he also flew to Wichita Falls, Tex., making an aerial inspection of a pipe line right of way.

A. I. LEVORSEN, chief geologist for the Tide Water Oil Company, with headquarters at Houston, Tex., returned to Houston the past week after a business trip to Tulsa and Dallas, Tex.

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TOM DUCKWALL, accounting department, Mid-Continent Petroleum Corporation, Terre Haute, Ind., is visiting friends in Houston and Dallas, Tex., and Tulsa on his two weeks' vacation now in progress.

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WILLIAM HEGAR, general manager of the Standard Oil Company of New York, at Tientsin, China, and MRS. HEGAR, have been spending a vacation in southern California combining business with pleasure.

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JOE SKELLY, assistant to the vice president, Stanolind Pipe Line Company, Tulsa, returned from a week's tarpon fishing at the Humble Oil & Refining Company's camp at Port Aransas, on the Gulf Coast of Texas.

* * *

JACK CAMPBELL, production superintendent for the Texas Pacific Coal & Oil Company, has been transferred from Thurber to Midland, Tex., to supervise development of the company's properties in West Texas and New Mexico.

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C. S. VOGEL has resigned as Fort Worth and Dallas representative for the Mid-Continent Supply Company and has accepted a position with the Hough Manufacturing Company. His headquarters will be maintained at Fort Worth, Tex.

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CARL ORRISON has returned to McPherson, Kans., to be superintendent of the Dickey Refining Company's plant there. For the past year he has been with the Pan American Refining Corporation at its Texas City, Tex., refinery.

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W. A. RUSSELL, of Milham Exploration Company; L. A. WILLIFORD, of Macmillan Petroleum Company, and JOHN W. DEICHMAN, of Bolsa Chica Oil Company, were recently elected directors of the Los Angeles Petroleum Accountants Society.

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ROBERT HEAL has returned to Petrolia, Ontario, from Persia after completing a year's drilling contract with the Anglo-Persian Oil Company. On his way home, Mr. Heal spent three months in England where he witnessed the royal jubilee celebrations.

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LAWTON B. BECKWITH, a graduate of Minnesota University in chemical engineering and later instructor in chemistry at the University of Montana and for the past several years a member of the Union Oil Company's technical staff at Wilmington, has been transferred to the main office in Los Angeles, Calif., as a member of the asphalt sales department. He is at present engaged in a survey of corrosion prevention and concrete curing.

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A. G. HAGLUND, of the Axelson Manufacturing Company, has left Los Angeles, Calif., and will be gone until the middle of January, 1936, on an itinerary that includes visits to 25 foreign countries. Mr. Haglund, who is Axelson's vice president and direct factory foreign representative, will visit practically every oil field of any importance in the world during his trip, except South America, Mexico and Canada. With the exception of his journey from Los Angeles to New York and from New York to London, England, all of Mr. Haglund's trips will be by airplane where possible. His return trip from the Orient will be via the new Pacific Clipper Service. This is the third trip of international scope which Mr. Haglund has made during the past 18 months. His last tour included all South American oil fields. The first included numerous points in Continental Europe, in company with J. C. AXELSON, president of the company.

## Rocky Mountain Area

(Continued from Page 129)

**GALLATIN COUNTY**

Montana Gas & Pet. Corp.'s No. 1 Adams, SE SE SE Sec. 36-2n-1e. Drlg. 1,421 ft.

### Glacier County

The Cut Bank Field showed a spurt in activity this week with eight new locations and three completions. The best completion was the Montana Power Gas Co.'s No. 1 Miller, C NW NW Section 28-33-5w, in the southern part of the field 3 miles southeast of the town of Cut Bank, a south offset to its No. 1 Scheuren, which made only 59 bbls. initial when completed last fall. The new producer swabbed 350 bbls. first 24 hours from the upper Cut Bank at 2,980-3,028 feet and the lower Cut Bank at 3,048-78 feet. Oil rose 1,100 feet from the first sand and increased to 2,000 feet from the second sand.

The next best completion was the Texas Co.'s No. 2 Morrison, NW cor. Section 22-35-6w, an outside well in the northwestern part of the field half a mile west and southwest from the nearest producers. It swabbed 222 bbls. first 24 hours from the pay at 2,850-90 feet and pumped 166 bbls. first 24 hours.

The third completion was the Indian Oil Co.'s No. 2 Winkler, W SW SW Section 23-35-6w, which is estimated at 20 bbls. at a total depth of 2,875 feet. Oil rose 1,000 feet in the hole.

Askins' No. 1 Askins, Lot 24, Blk. 33, Sec. 12-32-6w. S.D. 2,700 ft.

C. P. Castle's No. 2 State, 600 ft. N of S line and 1,320 ft. E of W line, Sec. 36-35-6w. Rig.

A. B. Cobb's No. 1 Young, C SE NE Sec. 5-32-5w. Rig on location.

Consolidated Gas Co.'s No. 5 Tribal, Lot 5, Sec. 3-34-6w. Running 8¼-in. at 2,840 ft.

Consolidated Gas Co.'s No. 1 Arnold-State, C SW NE Sec. 26-35-6w. Location.

Consolidated Gas Co.'s No. 6 Tribal, C SW SW Sec. 10-34-6w. Drlg. 2,760 ft.

Dakota-Montana Oil Co.'s No. 3 Winkler, 440 ft. S of N line and 590 ft. E of W line, Sec. 26-35-6w. Spudding.

Gardner-Smith's No. 1 Tweedy, Lot 1, NE NE Sec. 36-33-6w. Drlg. 2,700 ft.

L. R. Hannah, tr.'s No. 1 State, Lot 5, Blk. 4, Sec. 12-32-6w. Drlg. 2,750 ft.

R. C. Jeffries' No. 2 Lukens, NE cor. Sec. 12-33-6w. Drlg. 2,450 ft.

Kately-Drumheller's No. 2 Ward, SE NE Sec. 10-34-6w. Drlg. 2,160 ft.

Kately's No. 1 Thronson, SW NW SW Sec. 25-35-6w. Drlg. 1,910 ft.

Montana Power Gas Co.'s No. 1 Bonnett, C SE NW Sec. 4-32-5w. Drlg. 1,700 ft.

Montana Power Gas Co.'s No. 1 G. Carrigeaux, C SE NW Sec. 28-33-5w. Location.

Montana Power Gas Co.'s No. 1 Heiland Unit, NW SE NW Sec. 27-36-5w. T.D. 2,862 ft.; 550 ft. of oil at 2,820-35 ft.

Montana Power Gas Co.'s No. 1 Lookhoff, C SW SE Sec. 28-33-5w. Drlg. 2,650 ft.

Montana Power Gas Co.'s No. 1 Miller, C NW NW Sec. 28-32-5w. Cmtd. 6⅝-in. on bottom at 2,990 ft. with 40 sacks; good show oil and gas.

Nadeau Bros.' No. 2 Coover, C NE NE Sec. 17-32-5w. Drlg. 2,500 ft.

Nadeau Bros.' No. 4 Van de Mar, C SW NE Sec. 35-35-6w. Drlg. 2,550 ft.

Par Oil Co.'s No. 5 Haines, C SW NW Sec. 2-34-6w. Rigging.

Santa Rita O. & G. Co.'s No. 1 Government, C NE SW Sec. 4-32-5w. Drlg. 1,260 ft.

Santa Rita O. & G. Co.'s No. 1 McCabe, C NW SW Sec. 28-32-5w. Drlg. 2,800 ft.

Santa Rita O. & G. Co.'s No. 1 Ritchie, C NW SW Sec. 5-33-5w. Running 6⅝-in. at 2,706 ft.

Santa Rita O. & G. Co.'s No. 2 Ritchie, C NE NE Sec. 6-32-5w. Drlg. 2,600 ft.

Santa Rita O. & G. Co.'s No. 1 Fisk, C SW SE Sec. 14-35-6w. Set 10-in. at 305 ft. with 150 sacks.

Santa Rita O. & G. Co.'s No. 1 Tribal, C SW NW Sec. 15-35-6w. Location.

Santa Rita O. & G. Co.'s No. 5 Whetstone, NE SE Sec. 22-35-6w. Set 7-in. at 2,830 ft. with 25 sacks.

Santa Rita O. & G. Co.'s No. 1 Whitehead, C SW SE Sec. 23-35-6w. Location.

Steele Creek Producers, Inc.'s No. 2 Carman, C SW NW Sec. 19-34-5w. Drlg. 2,560 ft.

R. C. Tarrant's No. 2 Getty, NW NW SE Sec. 2-34-6w. S.D. 2,700 ft.

R. C. Tarrant's No. 4 Britton, C SW SW Sec. 12-34-6w. Rig on location.

R. C. Tarrant's No. 6 Haglund, Jr., C SE NW Sec. 13-34-6w. Rig on location.

R. C. Tarrant's No. 1 O'Brien, C SE SW Sec. 29-34-5w. Rig on location.

R. C. Tarrant's No. 2 McClellan, C NW SE Sec. 12-34-6w. Rig on location; (formerly No. 1 fee).

R. C. Tarrant's No. 1 Ruetten-Wold, C NW NE Sec. 13-34-6w. Drlg. 1,580 ft.

Texas Co.'s No. 1 Aarronson et al, C N½ SE Sec. 21-35-6w. Drlg. 2,957 ft.

Texas Co.'s No. 1 Marie Hagerty, C SE NE Sec. 9-34-6w. Cmtd. 10¾-in. at 350 ft.

### Liberty County

A small discovery is reported in J. H. Hamilton and others' No. 1 Northern Farms, C NE SW Section 10-37-5e, in the Flat Coulee district. It encountered a sand at 2,803 feet and was drilled to 2,879 feet. Oil rose 300 feet in the hole and it bailed 60 bbls. in 12 hours. Some gas has been found in this district, but this is the first oil well.

**PETROLEUM COUNTY**

Hardendorf & Keyes' No. 1 Austed, SW NW SE Sec. 22-13n-28e. Spudding with cable tools.

### Phillips County

Two failures and one first report were reported in Phillips County. Grant Smith and others' No. 4 Phillips, E NW SW Section 2-24-23, Bull Creek district, encountered water at 270 feet and was plugged back to an oil show at 190 feet and indefinitely suspended. Guy Norman's No. 1 Pewitt, NE NW NE Section 20-24-24, Guinn Dome, had water in sand at 640 feet, total depth, and also in sands at 471-509 feet and 539-69 feet.

Little Rocky Dev. Co.'s No. 1, SE SE SE Sec. 17-24-24. S.D. to finance.

**ROSEBUD COUNTY**

Birney O. & G. Co.'s No. 1, SW SW SW Sec. 7-6s-42e. Drlg. below 325 ft.

**TOOLE COUNTY**

Crumley & Son's No. 2 Fryberger, C NE NE Sec. 24-35-1w. Drlg. 550 ft.

A. E. Crumley's No. 5 Shaw, NW SE SW Sec. 35-36-2w. Drlg. 1,801 ft.

E. B. Coolidge's No. 1 Shaw, SW SE NE Sec. 35-36-2w. Drlg. 550 ft.

P. L. Eddy's No. 5 Seabrook, NE SW SW Sec. 19-35-2w. Location.

Fraser & Kluth's No. 1 Severance, C SE NE Sec. 29-32-2e. U.R. 8¼-in. to set at 1,080 ft. for wtr. shutoff.

Graham Oil Co.'s No. 2 McDonald, E SE SW Sec. 19-35-2w. Rigging up.

Imperial Oil Co.'s No. 5 Craig, C NE NE Sec. 19-35-1w. Drlg. 400 ft.

T. P. Kyle's No. 1 Clark, SW SW SE Sec. 19-37n-1e. Resuming at 1,010 ft.

Monopeg Oils, Ltd.'s No. 3 Dipple, S SW NW Sec. 28-35-1w. Fishing at 1,355 ft.

Mon-Tex Pet. Co.'s No. 1 fee, SE NW Sec. 27-34-1w. Rigging.

Nepstead-Vanderpas' No. 19 Government, SE NW Sec. 33-35-2w. Location.

New Era Fuel Co.'s No. 7 Lorensen, CNL NW NE Sec. 27-35-2w. Drlg. 1,150 ft.

C. T. Olen's No. 1 Engermoen, SW SW NW Sec. 14-35-2w. Drlg. 300 ft.

E. O. Reickhoff's No. 2 Government, SW SW NE Sec. 3-35-3w. S.D. 300 ft.

Pfabe & Engleking's No. 3 Seabrook, SE SW SE Sec. 19-35-2w. Drlg. 1,200 ft.

C. Leonard Smith's No. 1 Eckhoff, C SE Sec. 6-33n-2e. S.D. 575 ft. for new boiler.

C. Leonard Smith's No. 1 Federal Land Bank, C NE SE Sec. 11-33n-1e. Spudding at 175 ft.

C. Leonard Smith's No. 1 I. Halverson, C NE SE Sec. 18-33n-2e. Spudding at 125 ft.

C. Leonard Smith's No. 1 H. Halverson, NW NE Sec. 18-33n-2e. Rigging light rotary at 250 ft.

Texas Co.'s No. 9 Bruins, C SE Sec. 9-35-2w. Cmtd. 7-in. at 1,543 ft.

## Kansas Fields

(Continued from Page 121)

feet of water in the hole at 3,681 feet, from Hunton lime topped at 3,676 feet. McBride, Inc., and Derby Oil Co.'s No. 1 Grandon, NW NE NE Section 3-24-4w, flowed 87 bbls. of oil and 110 bbls. of water, and 4,000,000 feet of gas from Chat, topped at 3,253 feet, total depth 3,416 feet. This well had a hole full of water from Siliceous lime at 3,811-17 feet and was plugged back. It is not a completion.

### Sedgwick County

Magnolia Petroleum Co.'s No. 9 Robbins, 300 feet from north line and 1,027 feet from east line of SE Section 20-28-1e, Sedgwick County, made 240 bbls. of oil and 72 bbls. of water on its potential test, producing from Chat pay at 3,106-11 feet, and was completed.

### Greenwood and Woodson

Gates Oil Co.'s No. 10 Kimbell, 1,100 feet south and 685 feet east of NW cor. Section 18-24-14, Winterscheid Pool, Woodson County, is a 60-bbl. completion from lime pay at 1,651-63 feet, which had been acidized.

Ward McGinnis' No. 1 Jackson, SW SW NE Section 26-25-8, Greenwood County, was dry and abandoned at 2,500 feet.

Molter & Henderson's No. 3-A Lewis, C SE SW Section 25-27-8, Greenwood County, is a 30-bbl. completion at 1,830-58 feet.

Markus made a location for No. 1 Shook, SW SW SE Section 31-23-12, Greenwood County. Oko Oil Co. deepened No. 1 Lovett & McNeill, SE SE SW Section 22-23-13, Greenwood County, from 1,631 feet to Mississippi lime at 1,733-65 feet and it made a 25-bbl. production after a shot but was not completed.

Connell & Marshall spudded in No. 1 Klick, SW NW SW Section 20-25-14, Woodson County.

### Chase County

Selby Oil and others' No. 3 Leady, SE NW SW Section 25-22-9e, in Chase County, just north of the Teeter Pool, was dry and abandoned at 2,688 feet.

### Rooks County

Eldorado Refining Co. and others are starting a wildcat, No. 1 Marshall, C SE SE Section 8-7s-17w, Rooks County.

### Ellis County

Joe Aylward is rigging up to start a wildcat, No. 1 Drelling, SE SE SE Section 3-14-16w, Ellis County.

Ashby's No. 1 Burns, SE SE NE Section 12-13-16w, is shut down at 3,280 feet with the hole full of water.

### Butler County

Polhamus and others' No. 1-A Semisch, SE SE NE Section 5-28-7, Butler County, was dry and abandoned at 2,765 feet.

Vickers Petroleum Co. made a location for No. 2 Moore, 660 feet south and 440 feet west of C Section 36-24-3, and for No. 1 McCraner D, 660 feet south and 440 feet west of NE cor. Section 2-25-3. Roth & Faurot were moving in material for No. 1 Falkenberg, SE NE SE Section 18-26-6. Polhamus and others were rigging up machine for No. 2 Semisch, C S half NE NE Section 5-28-7.

Eldorado Refining Co.'s No. 1 Huston, SE SE NW Section 1-25-3, was acidized in Mississippi lime at 2,675-90 feet and pumped 200 bbls. in 18 hours.

### Southern Counties

Champlin Refining Co.'s No. 2-B Latta, SE SW NW Section 9-30-2w, Sumner County, was completed in pay at 3,168-75 feet, which was acidized. The well pumped 179 bbls. initially.

E. B. Shawver's No. 1 Erker, NW SW NW Section 33-21-1w, flowed 409 bbls. in 24 hours from Chat at 3,653-81 feet, which was acidized. It was completed.

Lewis Production Co.'s No. 3 Pierce, NE SE SE Section 30-31-6, Cowley County, swabbed 310 bbls. in 24 hours from sand at 2,875-2,944 feet which had been shot with 70 quarts. It was completed.

Haddox and others' No. 1 Hughes, NW SW SE Section 21-30-11, Elk County, was dry and abandoned at 1,440 feet. This well was acidized at 1,245-65 feet with no results and had a dry sand at 1,425-40 feet.

## Gulf Coast Wildcats

(Continued from Page 114)

J. W. Sorrells' No. 1 Swift, Blk. 21, Abst. 318, H. N. Little Sur. Derrick.

Texas Co.'s No. 2 A.R.G.H. Co., 220 ft. E and 247 ft. N of SW cor. of Lot 38, H.T. &B. Sur. Drlg. shale 600 ft.

Texas Co.'s No. 8 Ewing, 770 ft. S, 41 deg., 40 ft. W and 648 ft. N, 47 deg., 59 ft. from E cor. of lease, H. N. Little Sur. Derrick.

Texas Co.'s No. 4 F. Leider, 150 ft. S, 42 deg. W from the lease line and 150 ft. S, 48 deg. E from NW line of Lot 3, H. N. Little Sur. Location.

Texas Co.'s No. 14-B Belcher, 660 ft. S 42 deg. W from No. 9-B Belcher, H. N. Little Sur. Drlg. sand 5,063 ft.

Texas Co.'s No. 1 O. W. Halligan, center of Lot 27, H.T.&B. Sur. No. 23. Location.

Texas Co.'s No. 1 O. W. Halligan, center of Lot 26, H.T.&B. Sur. No. 23. Location.

Texas Co.'s No. 3 O. L. Rash, 920 ft. S, 41 deg. E and 330 ft. S, 42 deg. W from N cor. of Lot No. 22, T. Spraggin Sur. T.D. 4,125 ft.; 7-in. csg. 4,075 ft.; I.P. 409 bbls. per day through ¼-in. choke; tubing pressure 440 lbs.

Texas Co.'s No. 4 A.R.G.G.H., 442 ft. W and 247.5 ft. S of NE cor. Lot 36, H.T.&B. T.D. 4,058 ft.; 7-in. csg. 4,050 ft.; I.P. 384 bbls. per day on various chokes.

Texas Co.'s No. 1 C. P. Dawson, 2,475 ft. S, 441.9 ft. W of NE cor. of Lot 59, H.T.&B. Sur. No. 23. T.D. 5,645 ft.; 7-in. csg. 5,627 ft.; waiting on orders; I.P. 500 bbls. per day; tubing pressure 550 lbs.; csg. pressure 575 lbs.

Texas Co.'s No. 17 Houston Oil Fields Assn., 244 ft. S, 244 ft. W from NE cor. of Lot 1, A.C.H.&B. Sur. No. 91. Coring oil sand 3,992 ft.

Texas Co.'s No. 16 Houston Oil Fields Assn., 247 ft. S, 440 ft. E from NW cor. of Lot 19, A.C.H.&B. Sur. No. 91. Derrick.

Texas Co.'s No. 2 Dawson, 247 ft. S, 241 ft. W of NE cor. of Lot 58, H.T.&B. Sur. No. 23. Location.

Trumba Oil Co.'s (J. M. Campbell) No. 1 H. McCauley, 150 ft. each way out of NE cor. of W 5 acres of Lot No. 2, A.C. H.&B. Sur. No. 91. Location.

Turnbull & Irwin's No. 1 Hart, center of Lot 10, H.T.&B. Sur. No. 24. T.D. 5,687 ft.; 7-in. csg. 5,654 ft.; I.P. 20 bbls. per hr. through ¾-in. choke.

Uscan Oil Co.'s No. 1 Metzer, center of Lot 19, H.&T.R. Sur. No. 23. T.D. 3,996 ft.; 7-in. csg. 3,970 ft.; testing.

Whittle Oil Co.'s No. 1 Duke, 330 ft. W of E line, center N and S Lot 18, H.T.&B. Sur. No. 23. Spudded and S.D.

Woodbine Oil Co.'s No. 1 A. F. Beddo, midway N and S lines of a 2-ac. lease, Blk. 29, H.T.&B. Sur. Location.

**OLD OCEAN—BRAZORIA COUNTY**

Harrison & Abercrombie's No. 2 Bernard River, 1,000 ft. N, 54 deg. W, 400 ft. S, 36 deg. W of No. 1, Charles Breen Sur. Drlg. shale 2,800 ft.

**PLEDGER—BRAZORIA COUNTY**

Humble O. & R. Co.'s No. 2 Smith, 2,050 ft. NE of SW line, 1,810 ft. NW of SE line, 220 ft. SE of W line, Gray and Moore Sur. Rig up.

**PORT LAVACA—CALHOUN COUNTY**

Adrian Moore et al's No. 1 O. F. McMaster, 330 ft. out of SE cor. of 80-ac. tract, M. Sanches Sur. Abd. 6,292 ft.

Empire G. & F. Co.'s No. 1 Dusek, 540 ft. W of E line, 440 ft. N of S line of E 70 acres of 102.4-ac. tract, W. Benavides Sur. Derrick.

Halliburton Oil Prod. Co.'s No. 2 Dave Burton, 330 ft. SW along E line of Texas Co.'s Shofner 10-ac. lease and 330 ft. at R/A, M. Ganches Sur. Derrick.

Texas Co.'s No. 1 Hackney, 1,504 ft. N of S line and 466 ft. E of W line of B. Rodriquez Sur. Derrick.

Texas Co.'s No. 1 Ada Foster, 1,250 ft. W along S line from SE cor. of lease and 466 ft. N at R/A, A. Esparza Sur. Rig up.

Texas Co.'s No. 1 Geryk, 1,400 ft. W from E line, 470 ft. N from S line of lease, Lot 7, Ysidro Benavides Sur. Coring sand; no show 6,484 ft.

Texas Co.'s No. 1 Kupatt, 466 ft. E from S line of lease, Lot 17, Ysidro Benavides Sur. Drlg. shale 2,550 ft.

Texas Co.'s No. 1 Shofner, SE offset to Steinberger's No. 1 Shofner, M. Sanches Sur. T.D. 6,241 ft.; attempted to make D.S. tests; reaming to bottom.

Texas Co.'s No. 1 R. Duelberg, 1,665 ft. NE along S line from SW cor. of lease and 990 ft. N at R/A, M. Sanches Sur. T.D. 6,270 ft.; 7-in. csg. 6,244 ft. Swabbing.

Texas Co.'s No. 1 J. A. Marten, 1,700 ft. SW along N line from NE cor. and 1,400 ft. at R/A in SE direction, Florentina Garcia League Sur. T.D. 7,512 ft.

Tulane Gordon's No. 1 W. A. Shofner, 339.5 ft. from N line, 295 ft. from E line of block, D. Tilley Addn., M. Sanchez Sur. Location.

**ANAHUAC—CHAMBERS COUNTY**

Humble O. & R. Co.'s No. 2 Broussard, 2,332 ft. E of W line, 2,332 ft. N of S line of Sec. 63, H.&T.C. Sur. Location.

Humble O. & R. Co.'s No. 3 Broussard, 1,399 ft. out of NW cor. of Sec. 63, H.&T. C. Sur. Derrick.

Humble O. & R. Co.'s No. 2 Clark, 2,332 ft. W of E line, 2,332 ft. N of S line of Sec. 57, H.&T.C. Sur. Derrick.

Humble O. & R. Co.'s No. 3 Middleton, 2,332 ft. N of S line, 2,333 ft. E of W line of Sec. 58, H.&T.C. Sur. Coring sand showing oil and gas 7,060 ft.

Humble O. & R. Co.'s No. 2 Middleton, 466 ft. out of NE cor. of H.&T.C. Sur., Sec. 64 T.D. 7,126 ft.; 7-in. csg. 7,076 ft.; I.P. 706 bbls. per day through ¼-in. choke; tubing pressure 250 lbs.; csg. pressure 1,500 lbs.

**BARBERS HILL—CHAMBERS COUNTY**

Mills Bennett Prod. Co.'s No. 2-C Barber, 93 ft. N of No. 1, 100 ft. E of W line. T.D. 5,220 ft.; 9⅝-in. csg. 5,180 ft.

Sun Oil Co.'s No. 7 Higgins, 50 ft. S of N line, 50 ft. W of E line. Drlg. sandy shale 3,223 ft.

Sun Oil Co.'s No. 11 Chambers County, half way between and in line with Nos. 9 and 10. Drlg. sandy shale 3,292 ft.

Texas Gulf Prod. Co.'s No. 25-B Kirby, 75 ft. S of N line of Kirby "B" Lease, S offset to No. 3 Fitzgerald. Derrick.

Texas Gulf Prod. Co.'s No. 6 Wilburn, 50 ft. N of S line, 25 ft. E of W line, William Hodges Sur. Drlg. lime 3,506 ft.

Texas Gulf Prod. Co.'s No. 12-A Kirby, 613 ft. N of S line, 85 ft. W of E line, W of Humble O. & R. Co.'s No. 8-B Kirby. Drlg. shale and lime 5,420 ft.

Texas Gulf Prod. Co.'s No. 2 Fitz-Meadows, 281 ft. S of N line, 50 ft. W of E line of T. S. Fitz lot. T.D. 4,563 ft.; P.B. 4,040 ft.; perforated csg.; testing.

Yount Lee Oil Co.'s No. 30 Chambers County School Land, 50 ft. N of S line, direct offset to Sun Oil Co.'s No. 11. Drlg. shale 1,438 ft.

**LOST LAKE—CHAMBERS COUNTY**

Pure Oil Co.'s No. 19 Mays, 400 ft. SE of No. 11, 400 ft. SW of No. 14, E. H. R. Wallace Sur. Prepare to set screen; T.D. 2,806 ft.

**BIG CREEK—FORT BEND**

Trans State Oil Co.'s No. 1 B. J. Wheat, 108 ft. N of S cor. of J. F. Ahlers lease and 88 ft. E at right angles, W. Young Sur. Rig up.

**BOLING—FORT BEND COUNTY**

Irwin Larsen et al's No. 1 J. R. Farmer, 100 ft. NW and 100 ft. SW from E cor. of 125-ac. lease, James Scott Sur. Location.

Midland Oil Co.'s No. 1 P. F. Coulter, 150 ft. from S line, 4,174 ft. from W line of 100-ac. tract, Miller League No. 2. Set screen; T.D 4,186 ft.

Navarro Oil Co.'s No 2 H. R. Farmer, 363 ft. from SW line and 160 ft. from SE line of Humble O. & R. Co.'s lease, James Scott Sur. T.D. 4,058 ft.; P.B. 3,870 ft.; prepare to test.

Sun Oil Co.'s No. 1 H. R. Farmer, 193 ft. from N line, 359.2 ft. from W line of 100-ac. tract, James Scott League Sur. Drlg. shale and lime 3,267 ft.

Yew Development Co.'s No. 1 C. E. Farmer, 400 ft. S and 325 ft. W of the NE cor. of 50-ac. lease, James Scott Sur. Rig up.

**ORCHARD—FORT BEND COUNTY**

Gulf Prod. Co.'s No. 43 Moore, 350 ft. E along S line of SW cor. of E.M.&G. Co. Sur. and 740 ft. N at R/A to said line of lease, 350 ft. E of No. 3 Moore. Drlg. shale 5,752 ft.

**THOMPSON—FORT BEND COUNTY**

Gulf Prod. Co.'s No 9 Hammerstram, S. Kennedy Snr Location.

Gulf Prod. Co.'s No. 10 Hammerstram, S. Kennedy Sur. Drlg. shale 5,294 ft.

Gulf Prod. Co.'s No. 11 Gubbels. Drlg. sand and lime 3,956 ft.

Humble O. & R. Co.'s No. 1-B Gubbels, 466 ft. out of SE cor. of 100-ac. tract, Sam Kennedy League. Drlg. shale and lime 4,821 ft.

Humble O. & R. Co.'s No. 25-A Booth. Derrick.

**HIGH ISLAND—GALVESTON COUNTY**

Yount Lee Oil Co.'s No. 47 Cade, Fitzsimmons Sur. Drlg. shale 3,227 ft.

Yount Lee Oil Co.'s No. 2 Louslafot, 150 ft. due S of No. 1, M. Dunman Sur. Drlg. shale 2,130 ft.

Yount Lee Oil Co.'s No. 2-A Taylor, 85 ft. W of No. 1, A. Dunman Sur. Derrick.

Yount Lee Oil Co.'s No. 46 Cade, 424 ft. SW of No. 35, 424 ft. NW of No. 36, Fitzsimmons Sur. Drlg. shale 5,130 ft.

Yount Lee Oil Co.'s No. 1 Taylor, D. Dunman Sur., 125 ft. due E of No. 1-A Gordon-Viterbo. Drlg. shale 4,630 ft.

Yount Lee Oil Co.'s No. 1 Acon & Hughes, 85 ft. E of No. 1 Pabst, on a 3.83-ac. tract, M. Dunman Sur. Drlg. shale 4,710 ft.

**DICKINSON—GALVESTON COUNTY**

Humble O. & R. Co.'s No. 1 Bayou Development Co., 375 ft. S of N line and midway between E and W lines of Lot No. 7, John Sellers Sur. Location.

Humble O. & R. Co.'s No. 2-B Maco Stewart, 400 ft. from N line of Bayou, 610 ft. from No. 1-B, John Sellers Sur. Drlg. shale and lime 5,836 ft.

Humble O. & R. Co.'s No. 1 E. E. Anderson, 375 ft. N of S line, and midway between E and W lines of Lot No. 4, John Sellers Sur. Location.

Humble O. & R. Co.'s No. 1 Fugger, 323 ft. from W line, 522 ft. from N line of lease, J. S. Sherman Sur. T.D. 8,081 ft.; 7-in. csg. 8,081 ft.; perforated csg.

Humble O. & R. Co.'s No. 1 Townes, 440 ft E of W line, 550 ft. N of N bank of Bayou, B.B.B.&C. Sur. Drlg. sand 5,896 ft.

Humble O. & R. Co.'s No. 2-A Maco Stewart, 3,324 ft. S along E line of S bank of Bayou and 566 ft. W of E line at R/A John Sellers Sur. 9⅝-in. csg. 7,334 ft.; drlg. shale and lime 7,336 ft.

Stanolind O. & G. Co.'s No. 1 State, 247 varas S of Humble O. & R. Co.'s No. 1 Jones. Spudded and S.D.

Turnbull & Irwin's No. 1 J. Piazza, 460 ft. W and 250 ft. S of Humble O. & R. Co.'s No. 1 Jones, J. S. Sherman Sur. T.D. 8,418 ft.; 7-in. csg. 8,256 ft.; completed for gas well showing some distillate; 2,800 lbs. of pressure.

**ARRIOLA—HARDIN COUNTY**

Houston Oil Co.'s No. 8 fee, Arriola Sur. Drlg. shale 3,511 ft.

Houston Oil Co.'s No. 6-X fee, 400 ft. SE of No. 4-X, 500 ft. SE of No. 5-X fee. Coring sand 4,580 ft.

Republic Prod. Co.'s No. 12 fee, 2,599 ft. S of N line, 474 ft. E of W line, of E. Arriola Sur. Rig up.

**BATSON—HARDIN COUNTY**

Danciger Oil & Refining Co.'s No. 1 Tom Wynne, 250 ft. S, 150 ft. W of Deering's No. 1 Cruse. Drlg. shale 5,220 ft.

John Deering's No. 1 Conzelman, 2,810 ft. E along N line, from NW cor. of H. Numm Sur. and 35 ft. at R/A, W. Donoho Sur. Drlg. shale 3,737 ft.

John Deering's No. 1 Bullock, 1,000 ft. N, 17 ft. E of middle line of 30-ac. tract, Bullock tract, Dondo Sur. T.D. 6,294 ft.; hole heaved to 4,944 ft.; S.D.

John Deering's No. 2 Cruse, 200 ft. E and 50 ft. S of No. 1 Cruse, W. Donaho Sur. Rig up.

**SOUR LAKE—HARDIN COUNTY**

Arlis Pet. Co.'s No. 1 Harkan and Langham. Dig pits.

**PIERCE JUNCTION—HARRIS COUNTY**

J. S. Abercrombie's No. 5 John Ritter, 259 ft. SW of No. 4, 1,047 ft. NE along SE line out of SW cor. of 160-ac. tract, thence 93 ft. NW at R/A, Sec. 51, J. Hamilton Sur. 10¾-in. csg. 1,220 ft.

Gulf Prod. Co.'s No. 11 H. C. Cain, 390 ft. from W line, thence 439 ft. at R/A to N line of 130-ac. tract, Jas. Hamilton Sur. No. 98. Rig up.

Gulf Prod. Co.'s No. 40 E. R. Taylor, 89.5 ft. along E line of E. R. Taylor's 560-ac. tract from SW cor., south offset to Hamil & Smith's No. 1 Howe. 13⅜-in. csg. 1,196 ft.; drlg. shale 1,615 ft.

Hamil & Smith's No. 1 C. W. Mowery, 50 ft. out of NE cor. of 600-ac. tract, Sec. 53, J. Hamilton Sur. Drlg. shale 4,693 ft.

Navarro Oil Co.'s No. 1 Dooley, J. Hamilton Sur. Milled out at 5,700 ft. and redrilled to 6,160 ft.

**HUMBLE—HARRIS COUNTY**

Sun Oil Co.'s No. 84 River, 300 ft. E of No. 61, in 292-ac. tract, R. Dunman Sur. Rig up.

Sun Oil Co.'s No. 83 River, Robert Dunman Sur. Drlg. shale and lime 827 ft.

Sun Oil Co.'s No. 29 Bender, Robert Dunman Sur. Drlg. sand and shale 4,289 ft.

Texas Co.'s No. 32 Humble, 350 ft. S. 50 ft. W of T.T. Co. and C.O.&G. and 1,718 ft. E of NW cor. of lease, Stevenson Sur. 10-in. csg. 560 ft.

**MYKAWA—HARRIS COUNTY**

Alpha Pet. Co.'s No. 1 Waggenhausen, C of E½ Lot 10, F. J. Rothas Sur. Drlg. shale 4,620 ft.

Sterling Oil & Ref. Co.'s No. 1 B. H. Williams, 200 ft. W of E line, 915 ft. N of S line of 29-ac. tract, Wm. Lovett Sur. Drlg. 3,000 ft.

Hamil & Smith's No. 1 Schep, 1,225 ft. N, 325 ft. E from SW cor. of the most southerly SW cor. of the I. W. Stinde Sur. Abd. 4,875 ft.

West Prod. Co.'s No. 1 Forbes, center of Blk. 15, F. J. Rothas Sur. Derrick.

West Prod. Co.'s No. 1 J. E. Lobit, Blk. 9, F. J. Rothas Sur. Drlg. shale 4,170 ft.

West Prod. Co.'s No. 1 B. J. Speck, 330 ft. each way from the NW cor. of the tract, W. R. Wilson Sur. Drlg. shale 3,621 ft.

**TOMBALL—HARRIS COUNTY**

Humble O. & R. Co.'s No. 2 Scherer, 1,872 ft. S of N line, 566 ft. E of W line, 566 ft. W of E line, J. H. Edwards Sur. Rig up.

Humble O. & R. Co.'s No. 2 Ford, 363 ft. from SE line, 525 ft. from most southerly SW line, E. Smith Sur. T.D. 5,561 ft.; flowing by heads.

Humble Oil & Ref. Co.'s No. 3 Moody, 527 ft. S of N line, 466 ft. E of W line of tract, J. H. Edwards Sur. T.D. 5,558 ft.; I.P. 10 bbls. per hr. through ¼-in. choke; tubing pressure 1,950 lbs.

Humble O. & R. Co.'s No. 1 Laird, 466 ft. from SE line, 20 ft. W of lease, J. Pruett Sur. T.D. 5,562 ft.; 7-in. csg. 5,418 ft.

Humble O. & R. Co.'s No. 2 Martens, 1,534 ft. from S line, 185 ft. from E line of lease, J. House Sur. T.D. 5,601 ft.; 7-in. csg. 5,597 ft.

Shell Pet. Corp.'s No. 1 Rudel, 947 ft. W, 377 ft. N of SE cor. of lease, Wm. Hurd Sur. T.D. 5,572 ft.; reaming to set csg.

Texas Co.'s No. 1 Mueller, 850 ft. S, 600 ft. W of NE cor. of lease, J. M. Hooper Sur. Drlg. sandy shale 3,823 ft.

**VANDERBILT—JACKSON COUNTY**

Imperator Oil Co.'s No. 1 Dutton, S C of Lot No. 11, Blk. 25, 450 ft. S of R.R. and 1,350 ft. W line of townsite, Ray Musquiz Sur. Rigged up and S.D.

Turman Oil Co.'s No. 1 T. H. Miller, 150 ft. each way out of E 50 ac. of Miller 100-ac. tract in Ray Musquiz Sur. Rigging up.

**BIG HILL—JEFFERSON COUNTY**

Yount Lee Oil Co.'s No. 1-B Pipkin & Davis, 2,225 ft. from E line and 2,385 ft. from N line of survey, Wm. McFadden Sur. Drlg. shale and lime 3,337 ft.

**FANNETT—JEFFERSON COUNTY**

Gulf Prod. Co.'s No. 5 Junker. Drlg. sand 4,051 ft.

**CLEVELAND—LIBERTY COUNTY**

Black Gold Pet. Oil Corp.'s No. 2 R. D. McDonald, 466 ft. W of most westerly E line and 466 ft. N of most northerly S line of survey, 933 ft. W of Gulf Prod. Co.'s No. 7-C Kirby Lbr. Co., T. Devers Sur. Derrick.

Gulf Prod. Co.'s No. 2 McDonald, 3,569 ft. W along S line from most easterly SE cor. of survey and 1,286 ft. N at right angles, Charles Smith Sur. Rig up.

Gulf Prod. Co.'s No. 9-C Kirby Lbr. Co., 1,967 ft. N, 1,400 ft. E from the NE cor. of J. S. Eldridge Sur. in the John Pleasant Sur. T.D. 5,852 ft.; 7-in. csg. 5,842 ft.; testing.

William J. Colegrove et al's No. 1 State School Land & Dev. Co., 446 ft. from W line and 170 ft. from S line of survey, Clayton Harper Sur. Location.

**ESPERSON—LIBERTY COUNTY**

General Crude Oil Co.'s No. 21 Esperson. Fishing; T.D. 6,631 ft.

General Crude Oil Co.'s No. 1 W. D. Kay, Malcolm Duncan Sur., 1,537 ft. along N Drlg. shale 7,687 ft.

General Crude Oil Co.'s No. 10 Davis, 2,000 ft. from E line, 660 ft. from S line of D. Kokernut Sur. Drlg. shale 7,285 ft.

**HANKAMER—LIBERTY COUNTY**

Cretaceous Oil Co.'s No. 3 Ezzell, 450 ft. W of E line of tract, Levi Barrow Sur. 7-in. csg. 2,555 ft.; T.D. 2,655 ft.; I.P. 219 bbls. per day.

Eljean Oil Co.'s No. 1 Ezzell, 1,325 ft. from N, 150 ft. from E line of Ezzell 175-ac. tract. T.D. 2,621 ft.; 7-in. csg. 2,593 ft.; comp.; no gauge.

Gulf Prod. Co.'s No. 1-B W. L. Bingle, 159 ft. E along S line of H.&T.C. Sur., thence 378 ft. Drlg. sandy shale 4,661 ft.

Gulf Prod. Co.'s No. 19 E. W. Boyt, 100 ft. from W line, 298 ft. S of No. 18, Amos Allen Sur. S.D. 2,651 ft.

Gulf Prod. Co.'s No. 20 E. W. Boyt, 1,235 ft. along W line of survey, 159 ft. from W line at R/A, Amos Allen Sur. Location.

Gulf Prod. Co.'s No. 21 E. W. Boyt, 110 ft. from W line of Amos Allen Sur. Location.

Gulf Prod. Co.'s No. 22 Boyt, Allen Sur. Drlg. lime 3,252 ft.

Will Strozier et al's No. 1 Ezzell, 700 ft. N of S line, 150 ft. W of E line of Levi Barrow Sur. Derrick.

**HULL—LIBERTY COUNTY**

Fondren & Snowden's No. 2 Humble-Hooks, 50 ft. from S line, 300 ft. NW of No. 1, J. Devore Sur. Drlg. shale 1,830 ft.

**VAN VLECK—MATAGORDA COUNTY**

Skelly Oil Co.'s No. 3 Cobb "B," 2,750 ft. from NW line, 2,900 ft. from SW line of M. Cummins Sur. Drlg. shale 5,016 ft.

**MARKHAM—MATAGORDA COUNTY**

Hamil & Hamil's No. 1 Hardy, 150 ft. E and 150 ft. S from NW cor. Hardy lease, H. Parker Sur. Drlg. 4,028 ft.

**MOSS BLUFF—LIBERTY COUNTY**

Gulf Coast Sulphur Co.'s No. 1 McManus, 586 ft. from E, 1,650 ft. from N line of W. A. tract, B. M. Spinks Sur. Location.

**CONROE—MONTGOMERY COUNTY**

Humble O. & R. Co.'s No. 74-A South Tex. Lbr. Co., 466 ft. from N line, 1,500 ft. from W line of 325-ac. tract, Alex McCowan Sur. Drlg. shale 1,936 ft.

**SPLENDORA—MONTGOMERY COUNTY**

Bryce McCandless et al's No. 1 Texas Long Leaf Lbr. Co., 330 ft. from N and E lines of the W½ of Blk. No. 8, Walker County School Land Sur. Derrick.

**ORANGE—ORANGE COUNTY**

Trio Oil Co.'s No. 1 D. S. Comier, 69 ft. W of E line and 39 ft. S of N line of 6.83-ac. tract in W. M. Dyson Sur. S.D. 2,912 ft.

**FORT NECHES—ORANGE COUNTY**

Texas Co.'s No. 4-B Polk, 750 ft. S and 1,450 ft. W from NE cor. of lease, Jacob Beaumont Sur. Location.

Texas Co.'s No. 5-B Polk, 750 ft. S and 850 ft. W from NE cor. of lease, Jacob Beaumont Sur. Drlg. shale 2,010 ft.

Texas Co.'s No. 6-B Polk, 750 ft. S and 250 ft. W from NE cor. of lease, Jacob Beaumont Sur. Location.

**LIVINGSTON—POLK COUNTY**

T. A. Carlton Oil Co.'s No. 2 Watt, 695 ft. N of No. 1, 365 ft. from E and W lines of lease, A. Viesca Sur. Rig up.

Gem Oil Co.'s No. 3 Watt, 300 ft. S line, 330 ft. W line of lease, A. Viesca Sur. Coring shale 4,119 ft.

Gem Oil Co.'s No. 6 Davis & Holmes, 462 ft. from W and 462 ft. from N line of survey, A. Viesca Sur. Rig up.

Humble O. & R. Co.'s No. 9 Granbury & Smith, 2,000 ft. from N and 466 ft. from E lines of Sec. 10, A. Viesca Sur. Drlg. shale 2,815 ft.

Sun Oil Co.'s No. 3 Pratt, 330 ft. W and 288 ft. S from SE cor. of T. A. Carlton Oil Co.'s 20-ac. lease, A. Viesca Sur. T.D. 4,255 ft.; I.P. 53 bbls. per day through ¼-in. choke.

**SAN FELIPE—WALLER COUNTY**

Buck Oil Co.'s No. 2 Vaughn, 300 ft. S, thence 200 ft. E from Seaport Oil Co.'s No. 1 Vaughn, J. McFarland Sur. Rig up.

**GRETA—REFUGIO COUNTY**

Hewitt & Daugherty's No. 12 Lambert. Rig up.

**REFUGIO—REFUGIO COUNTY**

Houston Oil Co.'s No. 11 Wilson Heard, 330 ft. S of center of N line on 5-ac. lease, Refugio townsite. Derrick.

Houston Oil Co.'s No. 27 Rooke, 660 ft. S of No. 1 McMullen Sur. Drlg. 4,880 ft.

United Gas Co.'s No. 20 Lambert. Drlg. shale 1,733 ft.

**TOM O'CONNOR—REFUGIO COUNTY**

Quintana Pet. Co.'s No. 11-A O'Connor, 3,200 ft. from W line, 2,900 ft. from N line of Swisher Sur. Drlg. shale 3,730 ft.

Quintana Pet. Co.'s No. 12-A O'Connor, 5,250 ft. from W line, 3,750 ft. from N line of Swisher Sur. Drlg. 3,520 ft.

Quintana Oil Co.'s No. 9-A O'Connor, 933 ft. SW of No. 7-A, Swisher Sur. T.D. 5,800 ft.; I.P. 1,450 bbls. per day.

Quintana Oil Co.'s No. 10-A O'Connor, 4,000 ft. from W line, 3,500 ft. from NW line, Sec. 3, Swisher Sur. Cored sand 5,749-71 ft.; T.D. 5,841 ft.; I.P. 1,300 bbls. per day.

**McFADDIN-O'CONNOR DISTRICTS—VICTORIA AND REFUGIO COUNTIES**

Texas Co.'s No. 9 McFaddin, 1,850 ft. N. 2 deg., 45 ft. S from No. 2. T.D. 6,208 ft.; 7-in. csg. 6,196 ft.; reaming tubing.

Houston Oil Co.'s No. 1 Fagan, 330 ft. from Guadalupe River on the Fagan Island, F. and J. M. Rodrigues Sur., SW of McFaddin Field. Coring broken sand and shale; odor of gas 2,235 ft.

**CLAY CREEK—WASHINGTON COUNTY**

Sun Oil Co.'s No. 13 Janner, 400 ft. NW of No. 9, 565 ft. NE of No. 10, J. F. Perry Sur. T.D. 1,449 ft.; recovered 20 joints of mud in 20 min. on D.S. test.

**LOUISE—WHARTON COUNTY**

Pure Oil Co.'s No. 2 Wharton, 400 ft. NW and 450 ft. NE from the most westerly cor. of Sec. 26, F. Walnut Sur. Moving in rig.

Pure Oil Co.'s No. 2 McIntyre, 485 ft. NE, 880 ft. SE from most NE cor. of 317.22-ac. lease, Morris & Cummings Sur. Rig up.

Pure Oil Co.'s No. 1 John Macha, 318 ft. from NW line and from SE line of F. Walnut Sur., and 467 ft. from NE line of 101.53-ac. lease, M.&C. Sur. No. 25. T.D. 5,160 ft.; 7-in. csg. 5,118 ft.; I.P. 277 bbls. in 21 hrs. through ¼-in. choke; tubing pressure 318 lbs.

**BAY JUNOP—TERRABONNE PARISH**

Texas Co.'s No. 6-B State, 458 ft. S, 498 ft. E of NW cor. of Sec. 34-21s-14e. Abd. 7,840 ft.

**BAY ST. ELAINE—TERREBONNE PARISH**

Texas Co.'s No. 3 School Board, Sec. 16-22s-18e. Location.

Texas Co.'s No. 10 State, 4,550 ft. E and 4,595 ft. S of NW cor. of Sec. 17-22s-18e. Building foundations.

**CALLIOU ISLAND—TERRABONNE PARISH**

Texas Co.'s No. 20 Calliou Island. T.D. 4,119 ft.; S.D.

Texas Co.'s No. 22 Calliou Island. Drlg. shale 2,836 ft.

**SOUTH LOUISIANA FIELDS**

**BLACK BAYOU—CAMERON PARISH**

Shell Pet. Corp.'s No. 22 Watkins, 2,320 ft. W and 1,340 ft. S of NE cor. Sec. 18-12s-12w. Drlg. shale 4,107 ft.

Shell Pet. Corp.'s No. 21 Watkins, 1,570 ft. E of NW cor. Sec. 17-12s-12w. Cmtd. csg. 4,099 ft.

Shell Pet. Corp.'s No. 3 State. T.D. 6,159 ft.; S.D.

**BOSCO—ACADIA AND ST. LANDRY PARISHES**

Superior Oil Prod. Co.'s No. 6 Larcade, 451 ft. N, 2,053 ft. E of SW cor. Sec. 26-8s-3e. Drlg. shale and lime 6,454 ft.

Superior Oil & Prod. Co.'s No. 1 E. Arceneaux, 2,027 ft. E of NW cor. of Sec. 35-8s-3e.
Drlg. shale and shells 6,213 ft.
Superior Oil & Prod. Co.'s No. 1 M. Benoit, 1,165 ft. W of SE cor. of Sec. 34-8s-3e.
Drlg. shale and lime 6,255 ft.
Superior Oil Prod. Co.'s No. 2 Domingua, 451 ft. N, 2,053 ft. E of SW cor. of Sec. 24-8s-3e.
Drlg. shale and sand 5,099 ft.
Superior Oil & Prod. Co.'s No. 8 Hernandez, 105 ft. E, 219 ft. N of SW cor. of NW¼ Sec. 34-8s-3e.
Drlg. sand and shale 3,370 ft.
Superior Oil Prod. Co.'s No. 5 Hernandez, 1,424 ft. S, 350 ft. W of NE cor. of NW¼ Sec. 34-8s-3e.
Drlg. shale and sand 7,478 ft.
Superior Oil Prod. Co.'s No. 2 Richard, 2,916 ft. S, 799 ft. W of NE cor. of Sec. 34-8s-3e.
Coring sand and shale 5,578 ft.
Superior Oil Prod. Co.'s No. 3 Johnson, 2,958 ft. S, 1,325 ft. W of NE cor. of Sec. 34-8s-3e.
Drlg. shale 8,525 ft.
Superior Oil Prod. Co.'s No. 2 Le Blanc, 1,498 ft. S, 937.09 ft. W of NE cor. Sec. 33-8s-3e.
Drlg. sand 8,372 ft.
Superior Oil Prod. Co.'s No. 2 E. Mire, 1,-939.07 ft. S, 916.82 ft. W of NE cor. Sec. 33-8s-3e.
7-in. csg. at 8,630 ft.; T.D. 8,655 ft.

**ASCENSION PARISH**

Athens Oil Co.'s No. 1 United Land, 1,600 ft. S, 1,530 ft. W of NE cor. Sec. 15-10s-4e.
Drlg. shale 2,633 ft.
Humble O. & R. Co.'s No. 5 Community, 328 ft. SW of NE line of section, 200 ft. at R/A to east bank of river, Sec. 33-10s-2e.
Drlg. shale 5,463 ft.
Humble O. & R. Co.'s No. 4 Community, 4,825 ft. from NE cor. and 283 ft. S of N line at R/A, Sec. 33-10s-2w.
Digging cellar.

**CAMERON MEADOWS—CAMERON PAR.**

Burton-Sutton Oil Co.'s No. 6 School Lot, 423 ft. E of No. 5.
Drlg. shale 2,304 ft.
Burton-Sutton Oil Co.'s No. 4 School Land, 2,591 ft. W and 150 ft. N of SE cor. of Sec. 16-4s-13w.
Derrick.

**CHOCTAW DOME—IBERVILLE PARISH**

Standard Oil Co.'s No. 1 Myrtle, 900 ft. N and 550 ft. W of SE cor. of SW¼ of Sec 52-9s-11e.
Rig up.
Standard Oil Co.'s No. 5 Gay, 2,450 ft. S and 425 ft. E of NW cor. of NE Sec 32-9s-1' 7-in. csg. 4,510 ft.; T.D. 4,581 ft.; I.P. 500 bbls. per day through ¼-in. choke.

**DOG LAKE—TERREBONNE PARISH**

Texas Co.'s No. 17 State.
Drlg. sand 5,591 ft.

**FOUR ISLE—TERREBONNE PARISH**

Texas Co.'s No. 5 State, 885 ft. S, 2,327 ft. E of NW cor. of Sec. 24-21s-16e.
Location.
Texas Co.'s No. 9 L. L. and E., 1,838 ft. E, 2,243 ft. E of NW cor. Sec. 24-21s-16e.
Abd. location.

**GARDEN ISLAND BAY—TERREBONNE PARISH**

Texas Co.'s No. 13 State, 3,391 ft. S and 1,-604 ft. W of NE cor. Sec. 107-23-32.
Rig up.

**GUEYDAN—VERMILLION PARISH**

Pure Oil Co.'s No. 4, Alliance Trust, 467 ft. E, 1,787 ft. S line of lease, Sec. 34-11s-1w.
T.D. 9,379 ft.

**HACKBERRY—CAMERON PARISH**

Gulf Prod. Co.'s No. 18 Erwin, 271 ft. W and 722 ft. N of SE cor. of Sec. 12-12s16w.
Drlg. sand 6,773 ft.
Sutton Oil Co.'s No. 2 Portier, 717 ft. S and 50 ft. W of NW cor. SW¼ SE¼ Sec 22-12s-16w.
Abandoned.
Texas Co.'s No. 14 State, 500 ft. SE of No 13, Sec. 13-12s-10w.
T.D. 5,449 ft.; P.B. 2,400 ft.; sidetracked at 2,550 ft.
Texas Co.'s No. 15 State, Sec. 13-12s-10w.
Drlg. shale 6,532 ft.
Union Sulphur Co.'s No. 3 Humble (W.O.).
Drlg. sandy shale 5,978 ft.
Yount Lee Oil Co.'s No. 13 Gulf Land, Sec 14-12s-10w.
Drlg. shale 5,010 ft.
Yount Lee Oil Co.'s No. 1-A Gulf Land 2,000 ft. S and 50 ft. E of the NW cor of Sec. 22-12-10.
Rig up.

**NEW IBERIA—IBERIA PARISH**

Iberia Oil Corp. and Y. D. Spell's No. 2 Bernard, 150 ft. E of No. 1, Sec. 54-12s-7e.
S.D. 3,846 ft.; salt.

**IOWA—CALCASIEU AND JEFF DAVIS**

Shell Pet. Corp.'s No. 16 Heyd, 990 ft. S, 996 ft. W of NE cor. Sec. 13-9s-7w.
Cmtd. csg. 1,340 ft.
Shell Pet. Corp.'s No. 4 Tuten, 330 ft. S, 1,819 ft. W of NE cor. SE¼ Sec. 13-9s-7.
Coring sand 6,217 ft.

**JENNINGS—ACADIA PARISH**

Port City Oil Co.'s No. 15 Jennings-Haywood, 198 ft. E, 348 ft. S of NW cor. Sec. 41-9s-2w.
S.D. 1,600 ft.
Yount Lee Oil Co.'s No. 7 Houssiere-Latiolais.
Drlg. shale 7,684 ft.

**LAKE BARRE—TERREBONNE PARISH**

Texas Co.'s No. 14 Lake Barre.
S.D. 3,951 ft.
Texas Co.'s No. 15 Lake Barre.
Drlg. shale 4,007 ft.

**LAKE PELTO—TERREBONNE PARISH**

Texas Co.'s No. 12 Lake Pelto.
Reaming; T.D. 5,521 ft.

**LEESVILLE—LAFOURCHE PARISH**

Gulf Prod. Co.'s No. 6 Allen Lane, Sec. 28-21s-22e.
Drlg. sand 3,515 ft.
Gulf Prod. Co.'s No. 12 Bernard, Sec. 26-21s-22e.
Location.
Gulf Prod. Co.'s No. 10 Bernard, 1,833 ft. E, 958 ft. S of NW cor. Sec. 26-21s-22e.
Derrick.
Emerald Pet. Co.'s No. 10, State, west bank, 300 ft. S of well No. 1.
Location.
Emerald Pet. Co.'s No. 11 State, east bank, 227 ft. N of well No. 1.
Location.
Emerald Pet. Co.'s No. 12 State, east bank, 250 ft. S of well No. 1.
Location.
Texas Co.'s No. 32 Leesville, 890 ft. S, 2,-434 ft. W of NE cor. SE¼ Sec. 27-21s-22e.
Location.
Texas Co.'s No. 33 Leesville, 1,590 ft. S, 2,-434 ft. W of NE cor. SE¼ Sec. 27-21s-22e.
Rig up.
Texas Co.'s No. 36 Leesville, 476 ft. S, 385 ft. E of NW cor. SW¼ Sec. 26-21s-22e.
Building foundation.
Texas Co.'s No. 37 Leesville, 1,266 ft. N, 103 ft. W of SE cor. NE¼ Sec. 27-21s-22e.
Building foundation.
Texas Co.'s No. 27 Leesville.
T.D. 4,289 ft.; attempting to make D.S. test.

**LOCKPORT—CALCASIEU PARISH**

Union Sulphur Co.'s No. 6 Moss, located between No. 2 and No. 5 (W.O.).
T.D. 6,665 ft.; set 450-ft. liner.

**STARKS—CALCASIEU PARISH**

Gulf Prod. Co.'s No. 37 Lutcher-Moore, 250 ft. E and 775 ft. N of SW cor. of Sec. 19-19s-12w.
Abd. 4,235 ft.

**PORT BARRE—ST. LANDRY PARISH**

Gulf Prod. Co.'s No. 12 Wilson Cochran, Sec. 4-5s-6e.
T.D. 3,620 ft.; completed for gas well.
Port Barre Oil Co.'s No. 2 Sybil, 3,680 ft. N easterly along section line, thence 55 ft. at R/A to the east, Sec. 20-6s-5e.
S.D. 3,763 ft.

**ROANOKE—JEFERSON DAVIS PARISH**

Classel et al's No. 1 La. Irrigation Mill Co., 695.5 ft. E and 475 ft. N of SW cor. Sec. 1-9s-4w.
Location.
Humble O. & R. Co.'s No. 1 Clayton, 2,223 ft. from S line, 440 ft. from E line, Sec. 10-9s-4w.
Drlg. sandy shale 2,672 ft.
Humble O. & R. Co.'s No. 2 C. N. Taylor, 1,320 ft. E, 440 ft. S of NW cor. of SW¼ Sec. 12-9s-4w.
Rig up.
Humble O. & R. Co.'s No. 1 Nelson Thomas, 880 ft. W of No. 2 Kratzer, 440 ft. N and W of SE cor. of 200-ac. tract.
Drlg. shale 8,804 ft.
Humble O. & R. Co.'s No. 2-B Devilbiss, 1,127 ft. W of No. 1-B, 440 ft. S of N line of S½ of Sec. 11-9s-4w.
Cmtd. csg.; T.D. 9,336 ft.
Shell Pet. Corp's No. 1 Jarnigan, 330 ft. E, 660 ft. S, NW cor. Sec. 12-9s-4w.
Drlg. sandy shale 9,919 ft.
Shell Pet. Corp.'s No. 3 Kratzer, 1,320 ft. E and 440 ft. N of SW cor. of lease.
T.D. 7,597 ft.; producing 475 bbls. oil, 49% S.W.; csg. pressure 575 lbs.; tubing pressure 475 lbs.
Shell Pet. Corp.'s No. 1-B Kratzer, 660 ft. N, 330 ft. E of SW cor. of SW¼ Sec. 1-9s-4w.
Drlg. shale, sand and lime 8,354 ft.
Shell Pet. Corp.'s No. 4 Kratzer.
Drlg. shale 7,725 ft.

**SULPHUR—CALCASIEU PARISH**

Union Sulphur Co.'s No. 1 Noble (W.O.).
Abandoned.
Union Sulphur Co.'s No. 3 Kelly.
Coring shale 6,015 ft.
Union Sulphur Co.'s No. 809 fee.
T.D. 3,461 ft.; I.P. 700 bbls. per day.

**WHITE CASTLE—IBERVILLE PARISH**

Shell Pet. Corp.'s No. 8 Wilbert.
Drlg. shale 3,157 ft.
Shell Pet. Corp.'s No. 1 White Castle Shingle Co., 1,830 ft. W, 100 ft. S from NE cor. of lease.
S.D. 4,234 ft.
Shell Pet. Corp.'s No. 1 Adams, 2,340 ft. N, 100 ft. E of SW cor. of lease.
Coring 8,197 ft.

**MISCELLANEOUS WILDCATS**

**TEXAS**

**AUSTIN COUNTY**

Deering & Kayser's No. 1 P. A. McClinton, 1,100 ft. from NW line and C NE and SW of 115-ac. tract in Thomas Bell Sur.
Drlg. shale 1,920 ft.
Paul English et al's No. 1 Felix Guhn, 1,000 ft. S, 350 ft. E from NW cor. of 71-ac. tract, D. Chomel Sur., 1 mile SE of Kinney.
Rig up.

**BRAZORIA COUNTY**

Amerada Pet. Corp.'s No. 2 Houston Farms Dev. Co., 2,150 ft. SE, 5,800 ft. SW of N cor. of B.B.B.&C. Sur., in the Perry & Austin Sur.
Rig up.
George Strake's No. 2 Truska, 991 ft. W of No. 1, H.T.&B. Sur., Sec. 7.
S.D. 6,000 ft.
Showers & Moncrief's No. 1 Hughey, 5,500 ft. NW of discovery well, in center of Lot 18, H.T.&B. Sur., Sec. 29, Abst. 292.
Location.
Texas Co.'s No. 1 Freeport Sulphur Co., 2,-764 ft. N, 1 deg. 40 ft. W and 1,134 ft. S. 88 deg., 20 ft. W of NW cor. of S. F. Austin Sur., Abst. No. 35, being in the Conception Arcola Sur.
T.D. 4,186 ft.; heaving shale; S.D.
Quintan Pet. Co.'s No. 1-B G. L. Wood, 2,778 ft. from W line and 5,555 ft. from S line of 1,483-ac. lease, Thomas Aisbury Sur.
Bldg. derrick.

**CALHOUN COUNTY**

Continental Oil Co.'s No. 2 American National Realty Co., 660 ft. from NW line, 660 ft. from NE line of Sec. 6, Blk. C, Pedro Garcia Sur.
S.D. 6,522 ft.

**CHAMBERS COUNTY**

R. A. Mason et al's No. 1 R. M. White, 3,125 ft. N of S line, 466 ft. W of E line of James McGahey Sur.
Bldg. derrick.
South Gulf Oil Co.'s No. 1 J. T. White, Luke Brian Sur., 460 ft. from N line, 460 ft. from W line of 47.9-ac. tract.
Abd. 7,114 ft.

**COLORADO COUNTY**

Walter C. Keeble's No. 1 Frank Weinkuhn, 150 ft. E of W line, 150 ft. S of N line of 150-ac. tract, F. A. Zimmershield Sur.
Location.

**FAYETTE COUNTY**

Lewis Franklin's No. 1 V. Dybala, center of 75-ac. lease, A. Thompson Sur.
Location.

**FORT BEND COUNTY**

C. B. Bunte's No. 1 Winston, 1,495 ft. E of W line, 2,381 ft. N of S line of 350.6-ac. tract, S. Isaacs Sur.
Location.
W. A. Shafer et al's No. 1 V. B. Bortash, 693 ft. SW of NE line and 1,003 ft. NW of SE line of Sec. 52, H.&T.C. Sur.
S.D. 2,900 ft.
George White et al's No. 1 M. M. Cravins, 1,000 ft. from N, 300 ft. W of SW cor. of survey, B.B.B.&C. Sur. No. 8.
Rig up.

**GALVESTON COUNTY**

Coast Pet. Co.'s No. 1 Stewart, 3,416 ft. S, 200 ft. E of NW cor. of 142-ac. tract, W. K. Wilson Sur.
Prepare to spud.
Gillock Pet. Co.'s No. 2 Maco Stewart, 900 ft. N and 150 ft. W of No. 1, Alex Farmer Sur.
T.D. 1,500 ft.; S.D.

**GRIMES COUNTY**

Hubert Holt et al's No. 1 Simon Fuqua, 1,200 ft. N of S line and 400 ft. W of E line of 177-ac. lease and survey, Moses Evans Sur.
S.D. 3,080 ft.
Dr. Marshall et al's No. 1-B Todd, 300 ft. from E line and 175 ft. from N line of 150-ac. tract in extreme NW cor. of county (25 ft. N of No. 1).
S.D. 2,008 ft.
Patton et al's No. 1 Yeager, 1,000 ft. W of E line, 170 ft. S of N line of 53-ac. tract and survey, A. Ruseolle Sur., NW of Iola Sur.
S.D. 1,900 ft.

**HARDIN COUNTY**

Kirby Pet. Co.'s No. 3 Kirby, 2,330 ft. W, 9,850 ft. S of NE cor. of J. Stephenson Sur.
Drlg. shale 4,830 ft.

**HARRIS COUNTY**

Graham & Gardner's No. 1 Hager, 150 ft. out of SE cor. of 736.8-ac. tract, J. W. Clepton Sur.
Drlg. sand 820 ft.
Herbert-Still & Hooper's No. 1 Racker, 990 ft. E of W line, 4,290 ft. N of S line of J. C. Ogburn Sur.
Drlg. shale 1,550 ft.
T. S. F. Oil Co.'s No. 1 J. B. Hine, Arthur McCormick Sur., Abst. 46.
T.D. 3,916 ft.; P.B. 3,507 ft. and tested wtr.; abd.
C. C. Foster et al's No. 1 H. K. Johnson 2,000 ft. from S line and C of E and W lines of G.C.&S.F. Sur.
Drilled 25 ft. and S.D.
Stanolind Oil & Gas Co.'s No. 1 F. J. Burkey, C of Lot 15, Blk. 105, H.T.&B. Sur. No. 5.
Location.
Stanolind Oil & Gas Co.'s No. 1 C. F. Gibson, C of Lot 9, Blk. 41, H.T.&B. Sur. No. 5.
Location
Stanolind Oil & Gas Co.'s No. 1 J. W. Horlow, C of Lot 10, Blk. 52, H.T.&B. Sur. No. 5.
Location
Stanolind Oil & Gas Co.'s No. 1 Ed Wells, C of Lot 3, Blk. 146, H.T.&B. Sur. No. 5.
Location.
Stanolind O. & G. Co.'s No. 1 fee land, 330 ft. S, 300 ft. E of NW cor. of 20-ac. tract Sur., Sec. No. 5.
T.D. 5,000 ft.; 9⅝-in. csg. 4,831 ft.; tested S.W.; no pressure.
West Prod. Co.'s No. 1 Woodburn, 1,320 ft. E of W line, 2,145 ft. N of S line of survey, A. Whitlock Sur.
Drlg. shale 7,210 ft.

**JACKSON COUNTY**

A. M. Harris' No. 1 Whitley, 800 ft. out of SE cor. of F. G. Keller Sur.
Location.
Shell Pet. Corp.'s No. 1 W. W. McCrary, 460 ft. out of SE cor. of 50-ac. tract, A Kountze Sur.
Abd. 7,408 ft.

**JASPER COUNTY**

Marathon Oil Co.'s No. 1 Jasper County Lumber Co., 330 ft. out of NE cor. of 176.5-ac. tract 5 miles SE of Jasper, T. C. Holmes Sur.
Rig up.

**JEFFERSON COUNTY**

Humble O. & R. Co.'s No. 1 J. T. White, 330 ft. out of SW cor. of T.&N.O.R.R. Sur. No. 370.
Location.
Sun Oil Co.'s No. 1 Hebert & Braussard, 4,-890 ft. NW along SW line and 660 ft. NE at right angles to SW line, B. Blackman Sur., Abst. No. 2.
Rig up.

**LIBERTY COUNTY**

R. M. Bruner et al's No. 1 N. Bell, 150 ft. from N line and 150 ft. from W line of Bell's 187-ac. tract, H.&T.B. Sur. No. 4.
Rigging up.
Extension Oil Co.'s No. 1 J. A. Lovett, 330 ft. from E and 600 ft. from S line of lease, P. P. Deevers Sur.
S.D. 4,048 ft.
J. W. Frazier et al's No. 2 Lynott & Buffum, 466 ft. from N and E lines of 60-ac. tract in extreme SE part of survey, James Robeson Sur.
Drlg. shale 3,210 ft.
Liberty-Independent Oil Co.'s No. 1 J. M. Neal, 3,550 varas from E line and 601 varas from N line of Samuel Strong Sur.
S.D. 4,110 ft.
A. L. Maxwell's No. 1 M. P. Hinchliff, 300 ft. from E line and 1,000 ft. from the N line of survey, H.&T.C. Sur., Sec. 10a.
Coring shale 5,460 ft.
Thomas et al's No. 1-A Eicke, 660 ft. from W line and 2,350 ft. from S line of tract in Green Sur.
T.D. 5,047 ft.; 6⅝-in. csg. at 5,029 ft.
Turnbull & Irwin's No. 1 Cox, 1,000 ft. from the E line and 200 ft. from S line of 108.2-ac. lease, F. J. G. Smiley Sur.
Location

**MATAGORDA COUNTY**

Continental Oil Co.'s No. 1 Feife, J. S. Criswell Sur., 3,000 ft. E of W line, 2,800 ft. N of S line of survey.
Drlg. shale 4,210 ft.
Dr. Griffith's No. 1 fee, 3,000 ft. from E line and 3,000 ft. from W line of Wm. H. Bell Sur.
Rig up and S.D.
Helmerich & Payne's No. 1 Hawkins, 350 ft. S, 70 deg. W of Cockburn Oil Co.'s No. 6 Hawkins.
Rig up.
Horace M. Smith, Inc.'s No. 1 Wadsworth ranch, 150 ft. out of S cor. of Lot No. 1, Blk. S. R. Fisher Sur.
T.D. 8,418 ft.; 7-in. csg. 8,376 ft.; prepare to test.

**MONTGOMERY COUNTY**

Travis Baker et al's No. 1 Foster Estate, 1,200 ft. E of W line and 700 ft. S of N line of Blk. No. 50, J. M. De La Garza Sur.
Derrick.
Charles B. Gohlson's No. 1 Aaron Parks, 250 ft. from S line, 200 ft. from E line of Parks 139-ac. tract, J. Lindley Sur.
T.D. 3,769 ft.; tested 2 joints of drlg. mud, 8 joints drlg. mud, cut with oil; preparing to run 7-in. csg.
Paul Sanderson, trustee's No. 1 Texas Long Leaf Lbr. Co., 3,500 ft. W, 1,750 ft. S of NW cor., Wm. Barker Sur.
Location.

**ORANGE COUNTY**

Blue Line Oil Co.'s No. 1 Godwin, Richard Ballew Sur., 300 ft. from E line and 150 ft. from NE line of Godwin 20-ac. tract.
S.D. 2,770 ft.
Ellis Oil Co.'s No. 1 G. W. Pell, 100 ft. from N and 300 ft. from W line of Pell tract in the J. M. Henerie Sur.
S.D. 1,720 ft.
Dick Schwab's No. 1 East Texas Canal Co., 330 ft. from the N and W lines of 214-ac. tract, John Jett Sur.
Drlg. shale 3,425 ft.

**POLK COUNTY**

Howard Daily et al's No. 1 Z. B. Knox, 1,450 ft. W and 1,920 ft. S of NE cor. of F. Chairs Sur., 16 miles NE of Corrigan.
S.D. 60 ft.
J. F. Anderson's No. 1 E. L. Duke (O.W.D. D.), 400 ft. from E and 350 ft. from S of SW cor. of P. Michelick 50-ac. lease, Abst. 59, P. J. Mineral Sur.
Waiting on a new mud pump; T.D. 5,304 ft.
J. W. Leggett et al's No. 1 Bergman, C of 294-ac. tract, or 1,100 ft. W of H.E.&W.T. R.R., J. T. Pinkney Sur.
Rig up.
Dick Schwab's No. 1 Lynch, 330 ft. out of NW cor. of 200-ac. tract in the George Jameson Sur.
Location.

**REFUGIO COUNTY**

Conroe Drlg. Co.'s No. 1 Weiss, NE cor. NW¼ Sec. 40, Bonnieview Subd.
Abd. 6,000 ft.
Cecil Hagen et al's No. 1 Edith Clarkson, 1,736 ft. from N line, 3,820 ft. from E line of J. Coughlin Sur.
Location.
Magnolia Pet. Co.'s No. 1 Woods, 330 ft. from S and W lines of S. Turner Sur.
Abd. 7,705 ft.

**ROBERTSON COUNTY**

H. L. Patton's No. 1 H. Ely, located on a 416-ac. tract, A. Manchola Sur.
S.D. 2,700 ft.

**SAN JACINTO COUNTY**

Shell Pet. Corp.'s No. 1 K. Moore, 5,400 ft. from W line, 1,250 ft. from S line of lease, T. F. De Rumayor Sur.
Rig up.
Ralph Sturam et al's No. 1 R. B. Love et al, 475 ft. S of N line and 2,000 ft. W of E line of 177-ac. tract, Drury McGee Sur.
Moving in rig.

**TRINITY COUNTY**

Gulf Prod. Co.'s No. 2 Trinity County Lbr. Co., 1,287 ft. S, 1,480 ft. S of the SW cor. of the Stanley & Barrett 99.5-ac. tract, Trinity County School Land Sur.
Drlg. shale 1,405 ft.

**VICTORIA COUNTY**

Costa Oil Co.'s No. 1 Henderson & Pickering, 330 ft. out of NW cor. of Lot 18, Wm. Rupley Sur.
Location.
Costa Oil Co.'s No. 1 Schovjasa, 330 ft. out of N cor. of Lot No. 14, Wm. Rupley Sur. Swabbed dry; rerunning screen; T.D. 4,780 ft.
Eastern States Pet. Co.'s No. 1 Williams, 330 ft. out of S cor. of 130-ac. tract, E. Benavides Sur.
Rig up.
L. A. Gillespie and Superior Oil & Gas Co.'s No. 1 R. W. Brandt, 330 ft. from NE line, 330 ft. from NW line of tract No. 11, Henderson & Pickering Subd., Wm. Rupley Sur.
Cmtd. surface csg.
L. A. Gillespie and Superior Oil & Gas Co.'s No. 1 John Janis, 330 ft. from SW line of survey and on the SE line of Nancy Dean Sur.
Location.

Gillespie and Superior O. & G. Co.'s No. 1 Parber, 330 ft. from N and E lines of Lot 6, Nancy Dean Sur.
T.D. 6,200 ft.; 7-in. csg. 5,485 ft.; will make drill stem test.
Magnolia Pet. Co.'s No. 1 Henderson & Pickering, E offset to discovery well, Wm. Rupley Sur.
Drlg. shale 1,590 ft.

**WALLER COUNTY**

Diadem Oil Co.'s No. 1 Urban Estate, 1,100 ft. from the N line, 800 ft. from W line of survey.
Prepare to spud.

**WASHINGTON COUNTY**

Powers Prod. Co.'s No. 1 Boenker, 550 ft. S, 350 ft. W from NW cor. of Dodson 160 acres, J. Newman Sur.
Drlg. shale 1,830 ft.

**WHARTON COUNTY**

Texas Co.'s No. 2 Pierce Estate, 2,425 ft. S, 31 degrees 20 ft. E, 4,400 ft. N, 58 deg. 40 ft. E from W cor. of Pierce Estate Land. I.&G.N.R.R. Sur. No. 39.
Drlg. shale 4,459 ft.

**SOUTH LOUISIANA**
**ACADIA PARISH**

Continental Oil Co.'s No. 1 T. Ortego, 999 ft. S, 500 ft. E of NW cor. SW¼ Sec. 28-7s-3w.
Drlg. shale 4,766 ft.
Humble O. & R. Co.'s No. 1 American Rice Mills, 660 ft. S and 1,320 ft. W from NE cor. Sec. 27-10s-1e.
Drlg. sandy shale 3,775 ft.

**AVOYELLES PARISH**

Southern State Pet. Co.'s No. 1 Boyette, 330 ft. N and 330 ft. E of SW cor. Sec. 28-2n-5e.
S.D. 3,887 ft.

**BEAUREGARD PARISH**

Chew & Kirby's No. 1 Long Bell Lbr. Co., 330 ft. S and W of C of NE¼ Sec. 26-2s-8w.
Drlg. shale 3,856 ft.
Richardson & Martin's No. 1 Southwest Lbr. Location.

**CALCASIEU PARISH**

Fred Oil Co.'s No. 2 Faizst, 262 ft. E and 33 ft. S of NW cor. SE¼ Sec. 26-8s-10w
S.D. 3,525 ft.
Fohs Oil Co.'s No. 1 Wasey, 275 ft. each way out of the NE cor. SW¼ of SE¼ Sec. 12-10s-8w.
Derrick.
Nicholas McCaleb's No. 1 Grey, 2,200 ft. S 1,200 ft. E of NW cor. Sec. 22-8s-13w.
S.D. 850 ft.
Texas Co.'s No. 5 Nickerson, 2,826 ft. N, 3,192 ft. W of SE cor. of Sec. 12-10s-8w.
Location.
Texas Co.'s No. 6 Nickerson, 287 ft. N, 289 ft. W of SE cor. of NW¼ Sec. 12-10s-8w.
Location.
Texas Co.'s No. 3 Nickerson, 3,739 ft. N 4,750 ft. W of SE cor. Sec. 12-10s-8w.
Drlg. shale 6,656 ft.
Union Sulphur Co.'s No. 7 State, 1,316 ft. N and 199 ft. E of the SW cor. of Sec. 12-9s-8w.
Location.
Union Sulphur Co.'s No. 9 State, NW offset to Texas Co.'s No. 2 Nickerson.
Drlg. wtr. sand 6,804 ft.
Union Sulphur Co.'s No. 1 Castle, 326 ft N and E of NW Sec. 13-9s-8w.
Drlg. sandy shale 6,265 ft.
Union Sulphur Co.'s No. 1 Buhler, 1,465 ft. N and 425 ft. W of SE cor. Sec. 11-9s-8w.
Drlg. sand 6,785 ft.
Union Sulphur Co.'s No. 6 State.
Drlg. sandy shale 6,967 ft.
Union Sulphur Co.'s No. 2 Powell, 1,279 ft. S. 1,621 ft. E of NW cor. Sec. 12-9s-8w.
Drlg. shale and lime 4,790 ft.
Wheeler Oil Corp.'s No. 1 School Lot, 1,708 ft. E, 1,325 ft. N of SW cor. Sec. 16-9s-7w.
S.D. 3,720 ft.

**CAMERON PARISH**

Magnolia Pet. Co.'s No. 1 J. B. Broussard 330 ft. E and S, out of NW cor. of the SW¼ of SE¼ of Sec. 13-13s-9w.
T.D. 7,244 ft.; P.B. from 6,112 ft. to 5,980 ft.
Steinberger Pet. Co.'s No. 1 Drew, 330 ft out of NW cor. NE¼ of Sec. 26-10s-11w.
Location.

**EAST BATON ROUGE PARISH**

Superior Oil & Prod. Co.'s No. 1 Duplanter-Community, 1,500 ft. westerly along the N line from the NE cor. of D. A. and E. A. Duplanter's 130.7-ac. tract, thence 330 ft at R/A.
Stuck D.S.; T.D. 7,747 ft.; W.O. at 4,026 ft.

**EAST FELICIANA PARISH**

Thompson Creek Oil Co.'s No. 1 Fannie Noland, 2,600 ft. E and 1,580 ft. N of SW cor. Sec. 70.
S.D. 1,589 ft.

**EVANGELINE PARISH**

Basile's No. 1 Haas, 1,680 ft. S of N line. 350 ft. W of E line of NE cor. Sec. 14-4s-2w.
Coring 5,888 ft.
Little Pigeon Oil Co.'s No. 1 McHugh, 1,300 ft. S, 220 ft. W of the NE cor. Sec. 26-12s-10e.
Location.

**IBERIA PARISH**

Texas Co.'s No. 1 State Fausse Point.
T.D. 4,368 ft.; reaming.

**JEFFERSON PARISH**

Lincoln Oil Co.'s No. 1 Rigaud, Sec. 28-21s-25e.
T.D. 7,039 ft.; R.U. to deepen.

**LAFOURCHE PARISH**

Southern Sulphur Corp.'s No. 1 D. L. Lagraize, 800 ft. E of NW cor. of Lot 7, thence 250 ft. S of Sec. 26-21s-22e.
Spudded and shut down.

**ST. BERNARD PARISH**

Emerald Pet. Corp.'s "Shell Beach Properties" No. 1, on S edge of Bayou Louis, Sec. 31-13s-15e.
Drlg. shale 4,470 ft.

**ST. MARTIN PARISH**

Texas Co.'s No. 7 St. Martin Land, 2,042 ft. N, 500 ft. W of SE cor. of Sec. 17-8s-7e.
Drlg. shale 698 ft.

**VERMILLION PARISH**

Moore Bros.' No. 1 Brussard, 350 ft. S of N line, 250 ft. E of W line, NE cor. Sec. 32-11s-3e.
S.D. 4,056 ft.

## La.-Ark. Wildcats

(Continued from Page 130)

A. C. Scott et al's No. 1 Noel Est., 330 ft. S and E. NW cor. Sec. 22-20-15.
W.O.S.R. 2,261 ft.
Shreveport Oil Corp.'s No. 5-B Muslow, 150 ft. S, 1,320 ft. E, NW cor. Sec. 9-20-15.
S.D.; high wtr.; 2,167 ft.
Simplex Oil Co.'s No. 1 Keeth, 660 ft. N and E. SW cor. SE Sec. 18-20-14.
Arranging test 2,340 ft.
Texas Co.'s No. 2 Thigpen, 300 ft. S and E. C Sec. 15-20-1e.
Set 6-in. 2,182 ft.
C. A. Tooke's No. 1 Gibbs, NE SE Sec. 16-20-15.
W.O.S.R. 2,224 ft.

**CALDWELL PARISH**

Critchell & Woods' No. 1 Kraft, 220 ft. N and W, SE cor. NW NE Sec. 18-11-3e.
Coring 1,440 ft.
G. D. Davis' No. 1 La.-Cen. Lbr. Co., Sec. 14-11-3e.
O.W.D.D. from 1,850 ft.
G. W. Zeigan et al's No. 1 La.-Central Lbr. Co., 175 ft. S and E, NW cor. SW SW Sec. 25-13-3e.
Set 10-in. 200 ft.

**CATAHOULA PARISH**

Geo. J. Phillips' No. 1 La.-Central Lbr. Co., 127 ft. N. 2,490 ft. W. SE cor. Sec. 2-9-6e.
Tested; estimated 500,000 ft. gas, 943 ft.

**CLAIBORNE PARISH**

E. T. Oakes' No. 1 H. W. Patton Est., 660 ft. S and W, NE cor. Sec. 1-20-5w.
Set 12½-in. 654 ft.

**DESOTO PARISH**

E. B. Bird et al's No. 1 J. H. Johns, 330 ft. N and W, center Sec. 20-14-6.
S.D.; W.O. 2,630 ft.
W. T. Coleman's No. 1 Walker, 330 ft. N. 660 ft. W. SE cor. SE SW Sec. 18-12-11.
Set 6-in. 826 ft.; comp.; est. 900,000 ft. of gas, 881 ft.
DeSoto Pet. Co.'s No. 1 B. Y. Wemple, C S½ SE NE SW Sec. 14-12-11.
Arranging to set csg. 2,590 ft.
E. L. Foster's No. 1 Youngblood, Sec. 9-11-14.
Set 7-in. 2,735 ft.; T.D. 2,860 ft.
P. G. Fraley et al's No. 1 G. R. Stell, 330 ft. S and W, NE cor. Sec. 5-12-16.
R.U. and S.D.
Leslie Prod. Co.'s No. 1 Ramsey, 150 ft. N and W of C Sec. 36-11-11.
Set 10-in. 45 ft.
National Oils, Inc.'s No. 1 B. Y. Wemple, NW SW Sec. 14-12-11.
S.D. 120 ft.
C. T. Ruffins' No 1 Lee, 400 ft. S, 334 ft. E, NW cor. SW Sec. 33-14-13.
Set 10-in. 88 ft.; drlg. chalk 1,810 ft.
Ben F. Smith et al's No. 1 Porter, 330 ft. N and E, SW cor. NW Sec. 25-12-13.
Coring 2,803 ft.
Ed Saffold et al's No. 1 Thigpen, 400 ft. S, and 308 ft. W, NE cor. SW NE Sec. 33-13-13.
Dry and abd. 1,730 ft.

**EAST CARROLL PARISH**

Century Oil & Drlg. Co.'s No. 1 Olive Dell, 660 ft. S. 300 ft. W, NE cor. Sec. 56-21-21e.
Drlg. 1,850 ft.
O. G. Collins' No. 1 H. L. Hunt, approx. center of Sec. 26-22-13e.
Arranging to test 3,035 ft.

**LA SALLE PARISH**

H. L. Hunt, Inc.'s No. 1-A King, 225 ft. S. 210 ft. E, NW cor. NE NW Sec. 36-10-1e.
Set 12½-in. 105 ft.; coring 1,514 ft.

**MADISON PARISH**

San. Land & Exploration Co.'s No. 1 Delta Land Co., Sec. 1-17-12e.
Drlg. 50 ft.

**MOREHOUSE PARISH**

Carbon Consolidated's No. 1 Archie, 560 ft. S, 330 ft. E, NW cor. SW Sec. 22-20-4e.
Set 12½-in. 125 ft.; set 8-in. 700 ft.
Carbon Consolidated's No. 2 Archie, 560 ft. S, 990 ft. E, NW cor. SW Sec. 22-20-4e.
Drlg. 50 ft.
Zeiger & Bacon's No. 2 Crossett Lbr. Co., 3,870 ft. N, 505 ft. E, SE cor. SE SW of Sec. 36, in Sec. 41.
S.D. 50 ft.

**OUACHITA PARISH**

American Liberty Oil Co.'s No. Golson, C NW Sec. 25-17-1e.
Rigging up.
J. E. Farrell & Co.'s No. 4 State of La., Sec. 50-20-4e.
Comp.; gauged 11,500,000 ft. gas 2,145 ft.
G. E. Gordon, tr.'s No. 4 Rea-Green, 1,078 ft. S, 1,122 ft. W, NE cor. SE Sec. 2-18-4e.
Drlg. 600 ft.
Pioneer Gas Co.'s No. 1 Filhoil, 2,436 ft. N, 307 ft. W, common cor. Sec. 11-18-4e.
Arranging to test, 2,215 ft.

**NATCHITOCHES PARISH**

Clyde Crichton's No. 1 Friedman Est., 406 ft. N, 428 ft. E, SW cor. Sec. 52-7-6.
Arranging test, 2,243 ft.
Ab Jones' No. 1 Brown Lbr. Co., 400 ft. N. 330 ft. W, SE cor. Sec. 5-10-10.
S.D. 1,023 ft.

**RED RIVER PARISH**

Sterling O. & R. Co.'s No. 1 Long Bell, Sec. 19-13-9.
P.B. to 1,175 ft.; tested S.W.
J. S. Tuffree's No. 1 Wilkinson, 1,320 ft. S and W, NE cor. Sec. 11-12-11.
S.D. 1,395 ft.

**SABINE PARISH**

G. H. Collins' No. 1-C Cranford, 330 ft. S and E. NW cor. SW NW Sec. 28-9-13.
Drlg. 1,860 ft.
M. T. Hines' No. 1 J. B. Hill, SW NE Sec. 4-6-11.
S.D. 2,460 ft.
Laurel Pet. Co.'s No. 1 Long Bell Lbr. Co., 330 ft. N and E, SW cor. Sec. 14-8-14.
Testing 2,280 ft.
Jack Lent's No. 1 Williams, Sec. 13-7-11.
Drlg. 978 ft.
H. H. Morris, trustee's No. 1 Henderson, 330 ft. S and W, NE cor. SW NE Sec. 29-9-13.
Using acid 1,698 ft.
Strickland et al's No. 1 Whitney Corp., Sec. 32-10-12.
Junked and abd. 1,590 ft.

**UNION PARISH**

Crescent Drlg. Co.'s No. 1 Woolie, SE cor. NW NW Sec. 34-19-1e.
Set 10-in. 40 ft.
Southern Prod. Co.'s No. 1 Clark, 500 ft. N and W, SE cor. NW NW Sec. 17-23-1e.
Drlg. 900 ft.

**WEBSTER PARISH**

Virgil Likens' No. 1 E. L. Stewart. 1,020 ft. E, 600 ft. S of NW cor. Sec. 23-18-10.
Drlg. 2,925 ft.

**ARKANSAS**
**ARKANSAS COUNTY**

Grand Prairie Realty Co.'s No. 2 Fischer, 412 ft. S, 12 ft. W, NE cor. NW NW Sec. 6-6-4w.
Rigging up.

**ASHLEY COUNTY**

Glenn E. McFaddin et al's No. 1 Boreine Farms, 660 ft. S and W, NE cor. Sec. 1-18-8.
W.O.; csg. 118 ft.

**COLUMBIA COUNTY**

Southern States Gas Co.'s No. 1 Piney Woods Lbr. Co., 330 ft. N and E, SW cor. NE NW Sec. 10-20-22.
S.D. 960 ft.
O. F. Whittaker's No. 1 F. Hall, 330 ft. N and W, SE cor. SE NW Sec. 11-15-20.
Comp.; pumping 15 bbls., 2,140 ft.

**HEMPSTEAD COUNTY**

A. H. Bagnelle's No. 1 Trattner & Rhinehart, Sec. 2-13-26.
S.D. 1,992 ft.
F. W. Martin's No. 2 Lafferty, C NW Sec. 17-14-24.
Rigging up.

**LAFAYETTE COUNTY**

Kamon & Neely's No. 1 Cockran, NW cor. SE SW Sec. 26-19-25.
Coring 3,540 ft.
Riggs Bros.' No. 1 Dubose, SE cor. SW NW Sec. 35-15-24.
Dry and abd. 2,817 ft.

**MILLER COUNTY**

M. D. K. Fitzwater's No. 1 E. H. Beck, 150 ft. N and E, SW cor. NW SW Sec. 34-15-26.
Drlg. 2,400 ft.
Fitzwater et al's No. 1 Norsen, SW cor. SE SW Sec. 20-15-27.
S.D. 3,177 ft.
King Oil Corp.'s No. 1 C. H. Schroder, 200 ft. N, 330 ft. E, SW cor. SW NE Sec. 24-14-28.
S.D. 3,167 ft.
King Oil Corp.'s No. 1 Anderson, 350 ft. E, 200 ft. S. NE cor. SW NE Sec. 16-14-27.
S.D. 2,573 ft.
Magnolia Pet. Co.'s No. 8 Olivet, 336 ft. S and W, NE cor. NW NW Sec. 3-16-26.
Drlg. 2,029 ft.
Frank Roe et al's No. 1 Frost Est., 150 ft. N and W, SE cor. SE SW Sec. 8-15-26.
Set 10-in. 120 ft.
Lee Timberlake's No. 1 Frost Est., 330 ft. N and E, SW cor. SW SE Sec. 27-15-26.
S.D. 3,100 ft.

**NEVADA COUNTY**

Carnett et al's No. 1 Floyd Munin, C SW Sec. 16-14-22.
S.D. 50 ft.

**OUACHITA COUNTY**

F. A. Book et al's No. 1 Arnold, Sec. 24-15-16.
S.D. 2,032 ft.
Snow Black Pet. Co.'s No. 1 O. F. Wyman, NW SW Sec. 36-11-16.
Set 10-in. 101 ft.
Chas. Steele et al's No. 1 Myar Est., 330 ft. N and W, SE cor. SW SE Sec. 16-13-18.
S.D. 1,450 ft.

**SEVIER COUNTY**

Pendleton & Vaughn's No. 1 fee, 1,160 ft. S, 330 ft. E, NW cor. SE.
Abd. 1,172 ft.
Pendleton & Vaughn's No. 1 Harrison Est., 265 ft. S, 30 ft. W, CEL Sec. 34-9-30.
Junked and abd. 1,185 ft.

**UNION COUNTY**

Gardy Drlg. Co.'s No. 1 Craig, Sec. 35-17-15.
S.D.; W.O. 2,211 ft.
Gulf. Ref. Co.'s No. 49 L. Werner, 4,620 ft. N, 60 ft. E, SW cor. Sec. 5-16-16.
Set 7-in. 6,224 ft.; T.D. 6,431 ft.
H. L. Hunt's No. 15 E. F. Gregory, 330 ft. N and W, SE cor. Sec. 10-17-14
Arranging to blow with air, 3,478 ft.
H. L. Hunt's No. 18 E. F. Gregory, 330 ft. N and E, SW cor. Sec. 11-17-14.
Derrick.
Mrs. R. K. Jones et al's No. 1 Davis, 330 ft. N and W, SE cor. NW NW Sec. 28-16-14.
Coring 3,168 ft.
Marine Oil Co.'s No. 3-A Union Sawmill, 330 ft. S and W, NE cor. SE SE Sec. 3-18-13.
Drlg. 2,730 ft.
McCreslenn Oil Co.'s No. 2 Parker, 420 ft. W, 330 ft. N, SE cor. NE SE Sec. 3-18-13.
Rigging up.
Joe Modisette et al's No. 1 D. S. Sturdevant, 330 ft. N and W, SE cor. Sec. 6-18-13.
Drlg. 4,016 ft.
C. E. Murdock's No. 1 Pumphrey, C SW NW NE Sec. 11-17-14.
Derrick.

**MISSISSIPPI**
**AMITE COUNTY**

Mineral Resources, Inc.'s No. 1 Anderson, C NE NW Sec. 14-3n-3e.
S.D 550 ft.

**BOLIVAR COUNTY**

White & Jones' No. 1 Ballou, SE SE NW Sec. 17-24n-7w.
Set 10-in. 295 ft.; drlg. 746 ft.

**CLARKE COUNTY**

L. Beckwith et al's No. 1 Long Bell Lbr. Co., 538 ft. S, 125 ft. W of C Sec. 10-2n-16e.
T.A.; lack of funds.
Clarke County Oil Co.'s No. 1 Dora Butler, C SW SW Sec. 15-2n-16e.
Set 10-in. 63 ft.

**HARRISON COUNTY**

Big Ridge Oil Co.'s No. 1 Hinzin, NE Sec. 13-7s-10w.
S.D.; W.O. 1,100 ft.

**HINDS COUNTY**

F. H. Robertson et al's No. 1 Martin, 660 ft. E, 330 ft. N, SW cor. N½ SW NE Sec. 26-6n-1e.
Comp.; 49,890,000 ft. gas, 2,479 ft.
Bob Weaver's No. 1 T. Russell & Oparka, C NW NW NE Sec. 26-6n-1e.
S.W. and abd. 2,464 ft.

**LAUDERDALE COUNTY**

Bob Dalton's No. 1 Bounds, Sec. 34-7n-15e.
S.D.; W.O. 1,600 ft.

**MONROE COUNTY**

P. J. McAlpine's No. 1 Frank Rye, Sec. 15-15s-17w.
T.A. 2,931 ft.
P. J. McAlpine's No. 1 Crook, 1,090 ft. S. 90 ft. W, NE cor. Sec. 15-13s-13w.
S.D. 2,500 ft.

**RANKIN COUNTY**

Cleve Love et al's No. 1 Ascher, 520 ft. S and E, NW cor. NE NE Sec. 18-5n-2e.
Rigging up.

**SIMPSON COUNTY**

Berry Corp.'s No. 2 R. T. Berry, Sec. 33-2n-4e.
O.W.D.D.; S.D. for fuel at 2,510 ft.

**WALTHALL COUNTY**

Mutual O. & G. Co.'s No. 1 Boyd, SW cor. SW SE Sec. 24-2n-9e.
Partly rigged up and S.D.

**WARREN COUNTY**

H. W. Elliott et al's No. 2 R. L. Parker, 780 ft. E, 1,570 ft. S, NW cor. Sec. 14-14n-1e.
S.D.; high wtr. 1,600 ft.

**WASHINGTON COUNTY**

Perkins & Dees' No. 1 Lee, 1,500 ft. E, 500 ft. N, SW cor. Sec. 33-15n-3w.
D.S. stuck 2,052 ft.

**WINSTON COUNTY**

Jack Vale et al's No. 1 Moody, 713 ft. N, 467 ft. E, SW cor. NW SW Sec. 3-13n-14e.
Drlg. 1,850 ft.

## La.-Ark. Proven Fields

**NORTH LOUISIANA**
**CADDO—BODESSA**

United Gas Public Service Co.'s No. 2 Caddo Levee Board, 1,126 ft. S, 25 ft. E, NW cor. Sec. 26-23-16.
Rigging up.
United Gas Public Service Co.'s No. 1 D. F. Barr, 1,320 ft. N, 1,551 ft. W, SE cor. Sec. 29-23-16.
Set 10¾-in. 2,096 ft.; drlg. 2,400 ft.
United Gas Public Service Co.'s No. 1 I. L. Young, C E½ SE Sec. 21-23-16.
Drlg. 5,377 ft.

**SABINE PARISH—ZWOLLE**

Alexander & Crane's No. 1 Fogman, SE cor. N¼ SW NE Sec. 18-7-11.
S.D. 2,540 ft.
Ivan A. Allen's No. 1 La. Long Leaf, 330 ft. N and W, SE cor. NW SE Sec. 12-7-11.
S.D. 2,120 ft.
Hunter Co.'s No. 15 Sabine Lbr., 2,640 ft. E, 1,320 ft. N, SW cor. Sec. 1-7-12.
Dry and abd. 2,700 ft.
H. C. Mauiding's No. 1 Davis, 350 ft. N and W, SE cor. NE NE Sec. 2-7-11.
Set 10-in. 40 ft.; drlg. 120 ft.
K. C. Peterson et al's No. 1 Bowman-Hicks, 330 ft. S and E, NW cor. SW NW Sec. 2-7-9.
Derrick down.
Texas Co.'s No. 1 Mary Cutrer, 686 ft. W, 671 ft. N, SE cor. NE Sec. 11-7-11.
Rigging up.
Tex.-La.-Ark. Oil Co.'s No. 1 Pickering Lbr. Co., Sec. 3-3-12.
S.D. 2,742 ft.

**EAST TEXAS (BORDER COUNTIES)**
**HARRISON COUNTY**

R. C. Payne et al's No. 1 Lowery, H. D. Spain Sur.
P.B. to 3,524 ft.

**MARION COUNTY**

Ed S. Holman's No. 1 Henderson, R. Bennington Sur.
P.B. to 2,443 ft.

**PANOLA COUNTY**

R. A. Graddy's No. 1 M. J. McCormick, J. McAdams Sur.
Moving in rig.
George Hudson et al's No. 1 J. F. Nail, C. McGeary Sur.
Set 8-in. 40 ft.; fishing for core bbl. at 2,345 ft.
Geo. Le Grand's No. 1 P. J. Wardleigh, A. Thompson Sur.
Set 10-in. 62 ft.
R. W. Price's No. 1 Crawford, J. A. Williams Sur.
Set 10-in. 64 ft.
Fred Stovall Drlg. Co.'s No. 1 H. D. Ivey. P. Martin H.R.S.
S.D. for csg. 1,930 ft.

**SHELBY COUNTY**

Cliff Stoval's No. 1 Pickering Lbr. Co., C. H. Patterson Sur.
S.D.; rig repair. 1,485 ft.

**ALABAMA**
**COVINGTON COUNTY**

Geometer Prod. Corp.'s No. 1 Culbreath, SW cor. SW NE Sec. 8-2n-14e.
Drlg. 6,100 ft.

**HOUSTON COUNTY**

Rice O. & G. Co.'s No. 1 Oakley est., SE cor. NW SW Sec. 9-3n-29e.
S.D. 2,776 ft.

**LAMAR COUNTY**

DeSoto O. & G. Corp.'s No. 1 Gardner, Sec 22-15s-16w.
Drlg. 4,300 ft.

**WALTON COUNTY—FLORIDA**

Geometer Oil Corp.'s No. 2 Walton Land & Timber Co., Sec. 18-1s-19w.
Drlg. core tests on block; R.U. and S.D.

# FIELD PROBLEMS FROM READERS

Edited by Thomas F. Smiley

This department is conducted in order that men connected with the drilling, producing and transporting branches of the petroleum industry may obtain aid in solving problems that confront them in their work. Readers are invited to send questions freely. These questions will be placed in the hands of persons capable of answering them authoritatively, and the answers, based on the best available information, will be published.

Each question should give as much detail as possible, especially if it involves depths of sands, types of sands and operations on adjoining or nearby proptries. The source of questions will be considered confidential, and only the initials of the sender will be published. Questions involving patented processes, intricate formulas or estimates of cost cannot be answered. If an immediate answer is important, one will be given by mail when the writer requests it.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or improved old ones.

## Anhydrite and Why It Appears Frequently in Drilling Logs

**Now and again I notice in the papers that in drilling a well they strike anhydrite. The significance of that is Greek to me and I will appreciate it if you can let me know whether that is a positive indication that oil does not exist. Or is it possible that you sometimes have to go through anhydrite before coming to oil?—C. R. P.**

Anhydrite is calcium sulphate. Gypsum also is calcium sulphate. The difference between these two substances is that the gypsum contains water, but the anhydrite, as the name indicates, is free of water.

Calcite, or spar, is composed of pure limestone. In ancient seas this material was carried in solution and had mixed with it some sulphur compound. The mass precipitated in layers of varying thickness and when dried out it is known as anhydrite.

If gypsum is heated it loses its water and is said to be calcined. In this state it has the same chemical composition as anhydrite.

Using the term anhydrite in reporting well logs indicates that the hole has entered or passed through a bed of this material which is used as a "marker" in many oil provinces.

The significance of this report lies in the relative position in which the bed of anhydrite is found by the drill. If the top of the bed is found high, and if the bed is of normal thickness for that locality, it usually follows that producing formations which may be found much deeper will be favorably located on structure to contain gas and oil.

Experienced oil men therefore follow details of the well logs closely for changes in position of various formations which they regard as markers for the area. All markers are not the same, for in some regions a particular form of limestone may serve as the marker, in another district it may be a shale, but whatever formation is regarded as the marker for the region it is logged carefully as to the depths at which the top and bottom are found and also as to its thickness.

If you can visualize a landlocked body of water, such as the Gulf of Mexico, into which many surface streams flow you have a general idea of conditions under which the lime formations were deposited.

The stream flow over masses of lime on the land, and the streams are made up of rain water. This rain water, pure when it falls, dissolves the lime and carries it in solution out through the streams into the ocean or sea.

The other minerals in solution mingled with the lime solution and by chemical reaction cause precipitation. These masses of limestone deposited on the bottom of old ocean and sea beds are thousands of feet thick in some regions in land once covered by seas.

Other materials are carried into the seas by the rivers and they form layer after layer of sedimentary formations. These formations may be likened to a layer cake of gigantic proportions.

Some beds are made of sandstones that contain pore spaces between the grains. Other formations known as shales are really dried-out muds. Still other porous formations are of lime. When these limestones were at the land surface rain water had dissolved part of the calcarious material and formed openings that may be compared with worm holes in wood.

It is in these porous parts of the formations that the oil and gas accumulate. But if the formations were flat, as they were laid down there would be no barriers to stop the movement of the oil and gas, consequently no accumulations of these hydrocarbons in commercial quantities.

Movements of the earth have caused the flat-lying formations, or layers, to warp or bend and in the upper part of these giant wrinkles the gas and oil accumulate.

As it is not probable that a lower layer of formation will be moved without disturbing overlaying ones, it follows that high or low positions of strata above the producing formations are indications of the conditions below.

So it is customary for our scouts to report relative positions of key beds or markers. It so happens that anhydrite is a good marker for some areas and it therefore appears in well reports.

## What Changes Occur in Oil as the Result of Withdrawing Gas?

**Just what effect does the removal of gas from oil in a pool have on the oil? I understand of course that the gas supplies the driving force that makes a well flow in its flush period, but there doubtless are changes undergone by the oil itself. For instance there must be some reduction in volume of the oil when the gas is taken out. Perhaps there is some change in gravity and in the viscosity of the oil. These are the kind of changes I mean as resulting from removal of the gas.—L. E. S.**

The following facts in answer to your question are provided by Ben E. Lindsly, formerly senior petroleum engineer at the Bartlesville, Okla., station of the U. S. Bureau of Mines:

When gas or oil is withdrawn in considerable quantity from a natural oil reservoir, the pressure within the reservoir diminishes, and if the oil is completely saturated with gas, this dissolved gas begins to evolve from solution. The liberation of gas from solution in oil causes the oil to change in several ways. The principal changes are: (1) Reduction in volume or "shrinkage"; (2) reduction in A.P.I. gravity; (3) decrease of energy in the oil, due to liberation of dissolved gas; (4) increased viscosity; and (5) increased surface tension.

One of the most surprising facts developed in the study of high-pressure well head and bottom hole samples is the great reduction in volume that takes place in some oils when the naturally dissolved gas is liberated. High-pressure well head samples taken from Oklahoma City and from Kettleman Hills and Ventura, Calif., fell in volume from 11.2 to 40.5 per cent when the dissolved gas was liberated by decreasing the pressure on the sample to atmospheric.

The degree of shrinkage that an oil undergoes when its dissolved gas is liberated depends upon the quantity of gas liberated and upon the composition of the gas. A given volume of the heavier gases, propane and butane for example, will occupy more space when dissolved in oil than an equal volume of methane. The reason for this probably is that the molecules of the heavier gases are larger than those of the lighter. When gases are not in solution, and particularly at low pressures, the distance between the gas molecules is so much greater than the dimensions of the molecules themselves that the mere size of the molecules has little effect upon the space occupied by the gas. Avagadro's hypothesis covers this phenomenon. It states in effect that all gases under the same conditions have the same number of molecules per unit volume. The fact that the heavier gases occupy more space than the lighter gases when dissolved in oil, and consequently cause greater shrinkage when liberated from solution is brought out conclusively when curves are constructed which show the volumetric changes that an oil sample undergoes when its dissolved gas is liberated by reducing the pressure on the oil sample.

With reference to the change in gravity due to the liberation of dissolved gas, Beecher and Parkhurst and Dow and Calkin showed several years ago, and W. N. Lacey more recently, that putting gas into solution caused the oil to become lighter, and conversely liberating gas from solution had an opposite effect. These facts are more pronounced in natural oil-gas solutions taken either from the bottom of the hole, or at high pressure from the well head.

The withdrawal of gas causes a shrinkage of the liquid volume of an oil pool regardless of whether oil is produced or not. This creates gas spaces in the sand body and has a tendency to promote by-passing of gas which might have been able to perform some useful work in driving oil toward a well. Some of the gas which is liberated from solution finds its way to the gas cap, and becomes a part of the free or extraneous gas. Also some of the gas liberated from solution probably remains within the oil body in the form of minute bubbles where the oil-bearing formation is a fine-grained sand. Such bubbles would undoubtedly interfere with the free flowing of the oil within the sand body.

The loss of energy in the oil due to the liberation of dissolved gas is an important point which should not be overlooked. Experiments on bottom hole samples in East Texas showed that the oil contained between 330,000 and 430,000 foot pounds of energy per cubic foot. This energy is due to the gas in solution which evolves and expands upon reduction of pressure. At 100 per cent efficiency it would require only 170,000 foot pounds to raise 1 cubic foot of East Texas oil to the surface. However, as the lifting of oil by the expansion of its dissolved gas is rarely over 20 per cent efficient, the importance of conservation and development of greater efficiency in utilizing the dissolved gas energy becomes apparent.

It is apparent that reducing the gravity of an oil by removing the lighter constituents from it must result in increasing its viscosity and surface tension, because the lighter constituents invariably have low viscosity and low surface tension. The removal of constituents having low viscosity and surface tension, therefore will result in increasing the viscosity and surface tension of the residual oil.

## Why Was It Called That?

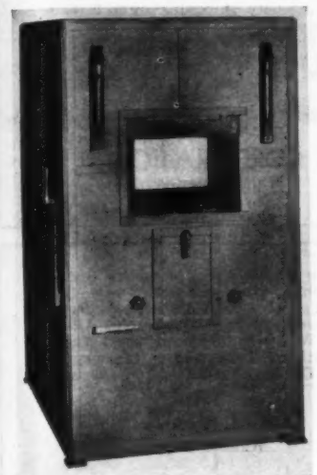
### CIVIL ENGINEER

The civil engineer was so called to distinguish him from the military engineer, but this meaning of the term is disappearing owing to the absence of any clear line between the kinds of work falling under the two historic classifications. An unusual task was performed by civil engineers at a Whig rally in Dayton, Ohio, in the Harrison presidential campaign of 1840. To estimate the number present three civil engineers operating independently were employed by different political interests to take the measurements of the space occupied by the audience while General Harrison was speaking. Each ran lines around the crowd, and the three agreed that four persons would occupy 1 square yard. Using this figure as a basis, one calculated there were 77,600 present, another estimated 75,000 and the third 80,000. In addition to this, officials estimated there were at least 20,000 visitors walking the streets who could not get near enough to hear "Tippecanoe."

# NEW AND IMPROVED EQUIPMENT

## High-Temperature Furnace Is Heated to 2,300 Degrees

The Hevi-Duty high temperature box furnace, manufactured by Hevi-Duty Electric Co., Milwaukee, Wis., operates 300° F. beyond the maximum range of



nickel chromium by the use of a new metallic resistor element. Break-down tests with the new element in actual furnace operation at 2,300° F. indicate an element life comparable with nickel chromium operating normally at 1,850° F.

This new element has a resistance 45 per cent greater than nickel chromium and a higher current carrying capacity, which makes possible ample power for high temperature work. The resistance change over a long period of time is negligible.

Hevi-Duty's standard form of radiant plate construction is used for mounting the resistors. The element has enlarged terminals which require no water cooling. In the furnace shown, elements are mounted on the side walls and under the hearth.

The furnace heats from room temperature to 2,300° F. rapidly, and is economical in operation. The furnace is equipped with gas curtain "atmosphere control." The protective atmosphere thus provided may be either oxidizing or reducing, and completely envelops the charge being treated. The heating element design used is adaptable to furnaces of other types and sizes, available for many production applications.

### DEPOSIT IS SELF-HARDENING

A new hard surfacing electrode designed for building up straight carbon steel, low-alloy or high manganese steel surfaces to resist abrasion is announced by the Lincoln Electric Co., Cleveland, Ohio. This new electrode, "Abrasoweld," the company says, will be found of particular value in restoring teeth, lips and bottoms of power shovels; lugs and treads of tractors; housings and impellers of centrifugal sand pumps; rock crushing equipment, gear and pinion teeth, etc. "Abrasoweld" electrode provides a deposit of abrasion-resisting alloy of the self-hardening type which surface hardens rapidly under conditions of impact and abrasion. The tendency of the deposit to chip off in service is said to be eliminated. "Abrasoweld" electrode is made in three-sixteenths inch size, 14 inches in length. It is used with reversed polarity with a current range of 125-200 amperes and 24-27 arc volts.

## Among the Equipment Houses

A. E. Jamison has been appointed representative for Chemical Process Co. in Tulsa, covering Oklahoma and Kansas. J. G. High is representative in Luling, Tex., and the company has opened a station in Russell, Kans.

—

Sullivan Machinery Corp. has moved its general offices in Chicago to the Bell Building, 307 North Michigan Avenue.

—

Jon R. Long, oil country pumping and production equipment, Fort Worth, Tex., has announced that he will maintain Exner Dodge Co. packer stocks in Fort Worth and will act as distributor to the Texas trade.

—

Armstrong Brothers Tool Co., Chicago, has purchased the line of Ideal chain tongs from the Carrier Engineering Corp., Newark, N. J., including name, inventory, etc.

—

Wilson & Bennett Manufacturing Co. has appointed C. Bennett, Bennett Brokerage Co., 223 Fourth Avenue North, Birmingham, Ala., as its representative in that area.

—

Brown Instrument Co., Philadelphia, Pa., manufacturer of instruments and controls, and the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., manufacturer of control systems and regulators, have opened a joint office in the 101 Marietta Street Building, Atlanta, Ga., with Wesley R. Moore in charge.

—

Champion Rivet Co. of Cleveland, Ohio, has appointed Thomas J. Kegg direct factory representative on welding electrodes in the Southwest with headquarters at Sawyer and Winter Streets, Houston, Tex.

—

W. B. Sullivan, well known in the development and manufacture of heat and corrosion resistant alloy castings, has joined the alloy department of Lebanon Steel Foundry, Lebanon, Pa.

—

W. L. Walker Co., 800 South Main Street, Tulsa, has been appointed manufacturer and distributor for the Imperial automatic shutoff valve, used in gravity and vacuum gathering systems and for the Master gauge oil thief.

—

The Macwhyte Co., Kenosha, Wis., is now carrying a large stock of Macwhyte wire rope in Fort Worth, Tex., at the Texas & Pacific Terminal warehouse. Lee Caldwell is district representative and L. A. Hines has been transferred from the Kenosha office to Fort Worth.

—

The New York district sales office of Republic Steel Corp. has been removed to the Chrysler Building. W. H. Oliver continues in charge as district sales manager.

—

English Brothers Machinery Co., Kansas City, Mo., has been appointed distributor for the Medart line of transmission equipment.

—

Wackman Welded Ware Co., Seventh and Victor Streets, St. Louis, Mo., has acquired the H. H. Ward steel drum plant in Chester, Pa. Acquisition of this plant affords an eastern seaboard location for the manufacture of the company's complete line of steel containers for the transportation of oils, alcohols, paints, chemicals and greases.

—

Three new directors of the Jones & Laughlin Steel Corp. are Dwight Clark, William B. Todd and F. E. Fieger. Mr. Clark is treasurer of the Phillips Properties, Inc. Mr. Todd was elected vice president in charge of sales as well as a director. He has been general manager of sales since 1931. Mr. Fieger, who since 1929 has been general manager, was made also a member of the executive committee and vice president in charge of manufacturing operations.

—

National Tank Co., Tulsa, is now equipped to furnish all types wooden tanks of its own manufacture, including vapor pressure and gas-tight tanks for storage of corrosive oil, in addition to its steel tanks and separators.

—

L. W. Lyons has been elected treasurer of the Westinghouse Electric & Manufacturing Co., succeeding Herman F. Baetz, who is retiring from active service.

## Combining Utility and Streamlined Beauty in a Truck

The success with which motor truck designers are combining streamlined beauty and profitable utility is shown in the illustration of a gasoline tank truck used by the Marathon Oil Co. It is mounted on the Dodge 2-ton chassis-and-cab of 169-inch wheelbase. A noteworthy feature of the body design, aside from the streamlining, is a large compartment conveniently reached through doors in the sides of the tank enclosure.

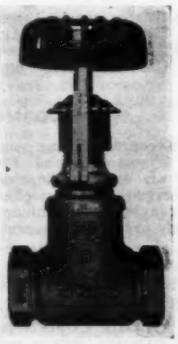
## Men Well Known in the Equipment Field

### V. WEAVER SMITH

V. Weaver Smith, for the past 10 years an active figure in the field of heat engineering problems in the oil industry, has been made vice president in charge of the business activities of the Broderick Manufacturing Co., Muncie, Ind. Prior to joining the Broderick organization May 1 of this year he was assistant to the president of The Lummus Co., New York, and head of that concern's oil heater department.

## Straight-Line Control of Flow Provided by Valve

The new Flocontrol valve for steam, oil, water or gas, announced by Hancock Valve Division, Consolidated Ashcroft Hancock Co., Inc., Bridgeport, Conn., affords straight-line flow control and micrometer adjustment.



The flow through the valve is always directly proportional to the number of turns of the handwheel because of the special slotted seat. This means that the user gets straight-line control. With the micrometer adjustment, the valve can be regulated to within one-tenth of a turn. Every increment of valve opening in tenths of a turn will vary the flow proportionately; that is, if the valve is set at two turns open, then twice as much steam or liquid will pass through it as when it is set at one turn.

There are many processes in which straight-line control of flow is imperative for efficiency of operation. The Flocontrol valve, a combined valve and control instrument, said by the manufacturer to be as easy to set as a clock, is provided in either globe or angle type.

# CLASSIFIED ADVERTISING

*For Sale—Equipment* *For Sale—Equipment* *For Sale—Equipment* *For Sale—Equipment*

We offer for sale the entire plant and equipment of the

## Continental Oil Refinery, Sapulpa, Oklahoma

at salvage prices. Seldom has such late type Topping and Cracking equipment been dismantled. Every item in excellent condition and offered at a fraction of original cost.

### Boiler Plant

4—525 H.P. Babcock & Wilcox Boilers, Water Tube, Foster Superheaters, Bayer Soot Blowers, Copes Regulators, Lagonda Stop Valves, Bailey Boiler Meters, etc. Last inspection rated 160 lbs. pressure. Unusually fine condition.

### Hot Oil Pumps

Made by leading manufacturers, National Transit, Byron Jackson, Worthington, Pacific, etc. Powered by Electric Motor, Steam Turbine and Cross Compound Condenser type Steam Engines. Capacity from 160 to 500 G.P.M.

### Crude Charging Pumps

Byron Jackson Centrifugal Pumps, powered by Electric Motors and Terry Steam Turbines, Kinney Rotary Gear Driven, powered by Electric Motors, Worthington Steam Pumps. Capacity 70 to 725 G.P.M.

### By-Product Recirculating Transfer Pumps

Pacific Horizontal Split 2 stage centrifugal pumps and Byron Jackson 2 stage Centrifugal Pumps, powered by Electric Motors. Capacity 50 to 250 G.P.M.

### Braun Heat Exchangers

22—Braun Heat Exchangers and Coolers. Capacity from 500 to 1200 Cu. Ft. Also Ross and Cross Exchangers.

### Complete Gas Absorption Plant

Designed to operate at 60 lbs. pressure. Capacity 100 bbls. day. Includes Gas Separator and Steam Towers, Scrubbers, Accumulator and Depropanizing Tanks, Electric Recording Instruments, Ingersoll-Rand Compressor, Electric Driven and Steam Driven Pumps, Steam and Liquid Pressure Control Instruments, and Braun Preheaters, Condensers and Heat Exchangers.

### Complete Continuous Treating Plant

Caustic and Water wash Towers and Doctor Solution Towers, Caustic Melting Tanks, and Air Agitated Caustic Mixing Tanks, Acid Blow Cases, Caustic Pumps, Acid Storage Tanks, Heavy plate, riveted, Sulphur Gasoline Drums, etc.

### Control Instruments

3—Complete control rooms containing Brown Electric Temperature recording Pyrometers and Flow Meters, Westcott Flow Meters, and Foxboro air actuated instruments. All instruments equipped with relay, electrically and mechanically controlled valves. Complete with thermo couples, wire, tubing, etc. Limited space prevents full listing, but nearly every requirement can be met.

Many other items too numerous to mention such as FOSTER WHEELER TUBE STILL, FRACTIONATING BUBBLE TOWERS, CENTRIFUGAL WATER PUMPS powered by electric motors, AGITATORS, STEAM PUMPS, FIRE PUMPS, FIRE FIGHTING APPARATUS, CONDENSER AND COOLING BOXES, STEEL STORAGE TANKS, CRANE and WALWORTH STEEL VALVES and FITTINGS, 100 miles of PIPE LINE from ¾" to 12", etc., etc.

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Located at Chanute, Kansas, cost over a million dollars, operated until Feb., 1935. Will sell all or any item in plant consisting of 2—1000 bbl. each Jenkins Cracking units, 5000 bbl. capacity skimming unit, 2000 bbl. Winkler Koch pipe still. Over 100 pumps of all kinds, condenser boxes, heat exchangers, 150,000 bbls. of steel storage tanks from 100 to 55,000 bbls., many miles of all sizes pipe, 50,000 valves and fittings Oakite treated. Complete laboratory equipment, complete stock of new repair parts. Inventories furnished on request.

Wire, phone, or write W. C. Berry or H. J. Galamba.

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64 North Second Street, Kansas City, Kansas.

138,100 ft. 6" Standard 19 lb. pipe, line couplings and complete pumping station. 2—150 H.P. DelaVergne oil engines, direct connected to 2—5½"x 16" Gould triplex vertical pumps 1000 lbs. pressure. All necessary equipment. 2—24'x80' steel buildings with overhead cranes in each. All pipe and equipment in station same as new. Will sell all or any part. Located in Kay County, Oklahoma, 4 miles south of Tonkawa on highway 177. Cash or terms. Also offer 60,000' of 19" OD and 40,000' of 16" OD welded steel pipe. Wire, phone or write.

**SONKEN-GALAMBA CORPORATION**

64 North Second St., Kansas City, Kansas.

5—Bessemer 80 H.P. Natural Gas engines, type 8, single cylinder, engines and compressors, 4 with 14"x20" cylinders and 1 with 7½"x20" cylinder, located at Magna City, Kansas. Price $600.00 each.
6—Bessemer 70 H.P. Natural Gas engines, belt driven, price $400.00 each.
5—Ingersoll-Rand Compressors, 2 cylinder, belt driven, with 12"x12" and 13½"x12" cylinders, price $400.00 each, located at Bloomington, Kans.
All of the above equipment guaranteed in A-1 condition and special price made on five or more.

**SONKEN-GALAMBA CORPORATION**

64 N. Second St., Kansas City, Kansas.

FOR SALE: Two 240 H.P., 180 R.P.M., 3 cylinder Busch-Sulzer Diesel engines in first-class condition with one 187 K W, 240 V, A. C. belt driven generator and direct connected exciter. These engines are now connected together in tandum but could be separated to operate as single units. Will sell either or both units. Price $12.50 per H.P. F.O.B. our plant. STANDARD-TILTON MILLING COMPANY, Dallas, Texas.

25 K.W. and 40 K.W. Gas Engines, 220 volts, D.C. Two 100 K.W. Gas Engine Generator Sets, 220 volts, D.C. 7x6 Ingersoll-Rand ER-1 Air Compressor. Six-inch Outer Pipe Threading Machine. Also large stock of lathes, pipe machines, milling machines, etc. Send for our list. Terms to suit.
CINCINNATI MACHINERY & SUPPLY CO.
26 West 2nd St. Cincinnati, Ohio.

4—300 amp. Lincoln Engine driven welder. A-1 condition. Stationary type. Service Co., 3732 Cedar, Cleveland, Ohio.

TWO 50 H.P. Bessemer Gas Engines, one twin cylinder 45 H.P. Bessemer Gas Engine, enclosed type, two cycle, completely rebuilt with new piston rings, magnetos, lubricators, etc. Priced right for quick sale. Located at Burrton, Kansas. Address Box G-601, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE, 2 Weber Diesel Engines; 50-HP, used four months, $650.00; 80-HP used twelve months, $850.00. Hobson-McFarland Tractor Co., 2131 Washington St., Kansas City, Missouri.

FOR SALE—One Cleveland baby ditcher with transport truck for same. Cheap for cash. Address Box G-702, The Oil and Gas Journal, Tulsa, Okla.

### *Oil Industry Printing*

OIL FIELD LEGAL BLANKS
Leases, assignments, releases, township plat books, well records, etc. Request on your letterhead gets free catalog. Olds Press, 215 East Third St., Tulsa, Okla.

### *Equipment Wanted*

WANTED
6 Miles Good 6 Inch I.D. x 6⅝ Inch O.D. Line Pipe 17-lb. or more, beveled for welding and in double random lengths. Will buy pipe in ground or ready to ship. Wright Brothers, Clarksburg, W. Va.

WANTED—12 in. stroke enclosed geared slush pump good for 1,000 W.P., one 4 or 6 cyl. engine 60 to 125 H.P. 1 rotary rig 6" shafts 200. 250 W.P. boilers, 4½ drill pipe, 14-16 pump. What have you?
R. R. NEWTON
Box 557, Laredo, Texas.

### *Financing*

PROSPECTUSES prepared and deals shaped up for registration or exemption under Federal Security Act. Fee basis. John Morris, Seventh Floor, 1237 Market St., Philadelphia, Pa.

MILLER, 604 W. Seventh St., Tulsa, Okla. Prospectus preparation and presentation. General assistance in all marketable matters. Correspondence invited.

### *Situations Wanted*

GRADUATE P.E. in refining, 2 yrs. exp. in major company refinery, specializing in stabilization and absorption. Unmarried. Address Box G-710, The Oil and Gas Journal, Tulsa, Okla.

REF. MGR. OR SUPT. One or more refineries. 15 yrs. exp., liquid and vapor phase cracking, design and const. Now employed. Can arrange personal interview. Address Box G-604, The Oil and Gas Journal, Tulsa, Okla.

GRAD. PET. ENGR. and exp. Stillman, desires position away from Gulf Coast. Have had op. exp. on var. types of vac. distillate units, shell type crude stills. Have also op. on gas absp. strip. units. Working now with maj. oil co. but have to make change due to climate's effect on wife's health. Address Box G-700, The Oil and Gas Journal, Tulsa, Okla.

# CLASSIFIED ADVERTISING

### Royalties—Production

PRODUCING OIL ROYALTIES
at Wholesale.
**John P. Booth**
Union Nat'l Bank Bldg.
Wichita, Kans.

BETTER CLASS
MONTHLY PAYING ROYALTIES
Quoted Dealers Exclusively.
W. E. COOK
Suite 812, Palace Bldg., Tulsa, Okla.

PRODUCING OIL ROYALTIES
for dealers.
H. P. BOWEN
842 Kennedy Bldg., Tulsa, Okla.

Producing Oil Royalties
at wholesale.
ROBERT L. KINKAID, INC.
Petroleum Bldg., Oklahoma City, Okla.

Income Producing Royalties
Mid-Continent Field
Harry A. George
427 Perrine Bldg., Oklahoma City, Okla.

DEALERS IN ODD LOTS
EAST TEXAS AND VAN POOL
PRODUCING OIL ROYALTIES
We Buy and Sell.
E. T. MARION REAL ESTATE CO.
401-2 Slaughter Bldg.,
Dallas, Texas.

PRODUCING OIL ROYALTY paying monthly income in half acres and upwards at reasonable prices. Federal listed. S. J. Jewell, P. O. Box 35, Tulsa, Okla.

ROYALTY and Leases, Wheeler and Gray Counties, Texas. For quick direct dealers get in touch with
E. B. REEVES,
Lock Box 475, McLean, Texas.

TEXAS ROYALTIES AND LEASES

I have owned and sold extensive oil royalties and leases in Texas for four years and so far have not owned or sold any leases or royalties that have not produced.

I own and will sell at this time heavily productive royalties in Van and East Texas ranging in price from $400.00 an acre up. I have one forty acre lease in Upshur County, East Texas Field on a three hundred acre farm. Three weeks ago they brought in a good well at the other end of this farm. I will sell this for $200.00 an acre or will entertain a drilling proposition.

I sold a similar forty acres sixty days ago in Upshur County, Texas, and they have since brought in a well on this forty acres making one hundred and forty barrels an hour through the choke. They will drill eight wells on the acreage and its recovery is estimated at 600,000 barrels of oil. When I sold it it did not look any better than the forty acres that I am offering at this time for $200.00 an acre.

I own and will sell one-half of 240 acres of royalty on the edge of Wheeler County on which the Smith Brothers of McLean, Texas, are now drilling a well. The Smith Brothers have not had a dry hole to their credit in this field. I will sell 120 acres of this at $25.00 an acre. The Smith Brothers brought in a well in Wheeler County ten days ago for five thousand barrels.

I own several hundred acres of royalty in Marion County, Mississippi, participating in the rentals under the Sun and Texas Companies. This royalty pays 9⅜% in advance from the rentals. I will sell for $3.00 an acre. Virtually all of the major companies are making a play in Mississippi and there are several wells being drilled in the section where my royalty is located.

All of these offerings are subject to prior sale and change of price. Will furnish complete data, geological reports and Governmental reports on any of them inquired for.

I buy royalties and leases in Texas and Oklahoma in any amounts.
P. R. KNICKERBOCKER
3237 Westminster St.
Dallas, Texas.
58-1679.

### Royalties—Production

ANDREW J. BARRETT
The Philtower
Tulsa, Oklahoma.

Van—East Texas—Louisiana Royalties
Bought—Sold.
WILLIAM MONROE LAYTON
67 Wall St., Suite 1510, New York City.

GULF COAST ROYALTIES
Bought and Sold.
Producing and non-producing royalties in salt dome fields of Texas and La.
ZENI OIL COMPANY
412 Esperson Bldg., Preston 4420.
Houston, Texas.

BROKERS — SALESMEN

Sell in the most active area in the United States—The Permian Basin of West Texas and Southeastern New Mexico. From the standpoint of royalty investors this area has much to offer. Can supply you with choice non-producing royalties located on geophysical highs. Also drilling blocks, close in acreage to production, or wildcat leases. I maintain my own field men who cover this area for me. Complete set of Forms and Reports for filing with Securities and Exchange Commission accompanies every order. Inquiries invited.
B. D. BUCKLEY
Paul Brown Bldg., St. Louis, Mo.

J. A. WOLF AND COMPANY
105 West Adams Street
Chicago, Illinois
Dealers in Oil Royalties since 1918.

OIL REPORT SERVICE
Specimen and Particulars on Request.
OIL INFORMATION BUREAU
501-04 Petroleum Bldg., Okla. City, Okla.

Income Producing Royalties
For
DEALERS AND TRUSTS.
PETROLEUM PURCHASING CORP.
Ramsey Tower, Oklahoma City, Okla.

PRODUCING OIL ROYALTIES
(ALL FIELDS)
Bought, Sold and Quoted.
HENRY L. BAKER CO.,
207 Van Nuys Bldg.,
Los Angeles, Calif.
Telephone Trinity 7391

VAN POOL — EAST TEXAS
Bought — Sold — Wholesale.
W. R. Brown & Co., Inc.
14 Prospect St., East Orange, N. J.

### Royalties—Production

HAVE MARKET FOR
SUBSTANTIAL
PRODUCING ROYALTIES

Exceptionally high immediate return not essential—prefer properties partially developed with excellent future — must be priced right.

We file all requirements with Federal Securities Commission and convert your royalties into cash promptly.

**JAMES B. McANALLY**
Tulsa, Oklahoma.

OIL DRILLERS interested in wildcatting requested to write Stoll Oil Refining Co., Louisville, Ky., for copy of free map showing promising territory based on faults in Kentucky.

PRODUCING OIL ROYALTIES
Bought (Wholesale) Sold.
Inquiries invited from Oil Companies, Bankers, Dealers.
M-K OIL COMPANY, INC.
20 Broad St. New York.

ROYALTY ON several tracts near Pushmataha County and McCurtain County wildcat wells for sale at One Hundred Dollars for half royalty on forty acres. Luther Calahan, Idabel, Oklahoma.

DEALERS — SOMETHING NEW

A $30,000 "open end" Trust, units of $25, with Non-Producing Properties exclusively, not registered. For full information including distributing terms, write
CERTIFIED ROYALTIES
CORPORATION
527 Fifth Avenue
New York, N. Y.

11,812 ACRES all in one body in Pushmataha County. Railroad runs through East side of land. Two 5-room houses on railroad, one set improvements about center of land. Timber from 10 inches up cut 1922. Timber worth price of land. 400 acres bottom in cultivation, under hog-wire fence, 1000 to 1500 Creek bottom land. Practically half of land could be cultivated if cleared. There are no leases or contracts of any kind. All royalty goes with the land. Watered by three Creeks, plenty of fish. Good title and taxes paid to date. No trades. $4 per acre. Luther Calahan, Idabel, Okla.

### Royalties—Production

NEW MEXICO, choice landowners' perpetual royalties in Lea County close to activity under major company leases. Just off the press, Lea County ownership map in 3 parts, $1.00 each. Roy G. Barton, Clovis, N. Mex.

HIGH GRADE producing oil and gas royalties offered to dealers. Billie Smallwood, P. O. Box 2261, Tulsa, Okla.

INVESTORS wanted to finance leasing of wildcat blocks and royalty pur. on structure in Russell Dist. and NW Kans. Have vast amount planetable surface geology and some core drill information on which to buy. L. T. S., 1204 Commerce Bldg., Kansas City, Missouri.

CALIFORNIA
OIL ROYALTIES
Long Beach Field, Los Angeles County, California.
NEW YORK FINANCIAL &
COMMUNITY CORP.
144 East 86th St.
New York, N. Y.

I OWN one thirty second royalty under Sec. 24, Blk. 77, Winkler County, Texas. The next prospective big oil field in Texas. H. T. JONES, 419½ W. Rio Grande, Fort Worth, Texas.

WILL PURCHASE BOSCO—VAN
Submit detailed offerings.
W. E. HOUSEL
56 Pine Street, New York City.

### Leases—Production

CORE DRILLING

Let us figure with you. No job too big, too small or too far.

CENTRAL CORE DRILL CO.
HUTCHINSON, KANSAS.

40 ac. NW Sec. 15-17-29, also 40 ac. NW SW Sec. 2-20-28, Eddy Co., N. M. A. R. Hewitt, 1325 Mont., St., ElPaso, Tex.

ORDOVICIAN West Texas test and several Woodbine sand and Gulf Coast wildcats now under way where you stand chance to win 10 to 50 for one. Leases, Royalties. E. CROFT, Proctor, Texas.

NEW MEXICO—My weekly scout report furnishes complete and reliable information on New Mexico developments. Send for copy. W. S. Patterson, Santa Fe, N. Mex.

NEW MEXICO Oil and Gas Leases and royalties. Send 50 cents in stamps for new State Oil Map of New Mexico. Roy G. Barton, Clovis, New Mexico.

1935 LAB. PRICE SCHEDULE
Oil Detecting Tests, $5.00 each. Contract price/100, $3.00 each. Erosional Tests, for final well locating, $2.00 each. Contract price/100, $1.00 each. Terms: Draft Attached Reports. (Acreage not accepted for payment.)
GEOLOGICAL SCIENTIFIC
SERVICE CO.
957 Davis, Ft. Worth, Tex.

FOR LEASE Sections 12 & 13, Block A-47, Andrews County, Texas. In the heart of development close to production. Will give ten year lease $1.50 per acre, 25c per acre rental. Owner, 1611 Pierce St., Amarillo, Texas.

### Patent Attorneys

REGISTERED PATENT ATTORNEYS
United States and Canada
Before disclosing your invention to anyone, send for blank form:
"Evidence of Conception,"
Instructions "How to Establish Your Rights" and complete information FREE!
LANCASTER, ALLWINE & ROMMEL
418 Bowen Building,
Washington, D. C.

### Geophysical Services

GEOPHYSICAL TESTS made of any Well Location in Tex. or Okla.: Crew Service $45; Via Express $20 by following our directions. Geological Scientific Service Co., 957 Davis, Ft. Worth, Tex.

## CLASSIFIED DISPLAY RATES

Classified Display Advertising is set with a border and may be used in one or two column sizes. Ten point text capitals are allowed; larger type not accepted.

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|---|---|---|
| *1 Inch* | *1 time* | *$5.00* |
| *1 Inch* | *13 times* | *4.50 per inch* |
| *1 Inch* | *26 times* | *4.00 per inch* |
| *1 Inch* | *52 times* | *3.50 per inch* |

This space may be contracted for over a period of one year from the date of the first insertion and is PAYABLE IN ADVANCE, MONTHLY.

## CLASSIFIED RATES

Classified advertising rates: First insertion, 35 cents a line; each additional insertion, 25 cents a line. PAYABLE IN ADVANCE. Six words usually make a line. Count as a word each one-letter word and each group of figures. White space computed at regular line rate. Allow two extra lines for blind ads. Ads of less than three lines not accepted. No formal acknowledgement is made, and proofs cannot be shown in advance of publication.

| | 1 time | 2 times | 3 times | 4 times |
|---|---|---|---|---|
| *3 Lines* | *$1.05* | *$1.80* | *$2.55* | *$3.30* |
| *4 Lines* | *1.40* | *2.40* | *3.40* | *4.40* |
| *5 Lines* | *1.75* | *3.00* | *4.25* | *5.50* |
| *6 Lines* | *2.10* | *3.60* | *5.10* | *6.60* |
| *7 Lines* | *$2.45* | *$4.20* | *$5.95* | *$7.70* |
| *8 Lines* | *2.80* | *4.80* | *6.80* | *8.80* |
| *9 Lines* | *3.15* | *5.40* | *7.65* | *9.90* |
| *10 Lines* | *3.50* | *6.00* | *8.50* | *11.00* |

We reserve the right to withhold all advertising of questionable character. To avoid delay be sure to send remittance with copy. We will set your ad in the smallest amount of space possible and refund all overpayments. One-time insertions will not be run until fully paid. Forms close MONDAY NOON before each issue date.

**THE OIL AND GAS JOURNAL**
*TULSA, OKLAHOMA*

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## California Fields

(Continued from Page 132)

being deepened following its failure to hold up to its initial production registered several weeks ago. The importance of the eastern extension of the Montebello Field is still more or less problematical due to the rather unfavorable performance of wells completed up to the present time and hence a number of operators are rather cool on the prospects of the area. It might be well to withhold judgment, however, because this section of the field offers possibilities despite the diametrically opposite views of prominent geologists. The absence of surface evidence of structure has complicated the problem and so it is anyone's guess. On its showing to date, however, the area thoroughly justifies minute exploration work.

A. N. Macrate has recompleted his No. 1 Gray in the Rosecrans Field of Los Angeles Basin after plugging back the hole from 6,462 feet to 5,980 feet and this well was returned to production pumping 184 bbls. of relatively clean 38.1 gravity oil per day. This well proved wet on a test several weeks ago at 6,462 feet and consequently the hole was plugged back. The success of Macrate has prompted the Allen Brothers to undertake the drilling of a test on the Callender lease and a new rig has already taken form. In the Brea Olinda Field, where the General Petroleum Corp. has been conducting some exploration work during the past year, the Chanslor Canfield Midway Oil Co. has started constructing a new rig for No. 99 Olinda which will be drilled in Section 9-3-9. The General Petroleum's latest project in this field is down 2,760 feet and should be finished within the next two or three weeks.

### Dominguez

Although drilling operations in the Dominguez Field of Los Angeles Basin appear to be decreasing, this is only a temporary condition and within the next week or 10 days this should become quite apparent. The Shell has located 10 additional drilling sites in this field and many of these wells will be started within the next 60 days. The Union has made provision for the drilling of six new wells in the immediate future and can be expected to maintain a normal drilling program for this field. At the present time the Shell is building new rigs for three wells and the Union Oil Co. is making preparations to start two new projects within the next 10 days. During the early part of the current week, the Shell successfully completed No. 74 Reyes, a new well, and this project was brought in flowing 861 bbls. of clean 31.2 gravity oil and 2,100,000 feet of natural gas per day from 4,568 feet after the hole had been finished with a 4½-inch liner carrying 275 feet of perforated.

### Mountain View

Drilling operations in the Mountain View Field of Kern County are getting smaller with each succeeding week, but there are a number of projects approaching completion depths and so we may expect to register several completions during the next two or three weeks. These potential producers nearing completions include General Petroleum's No. 5 Brantley, No. 3 Wright Bloemer of the A. T. Jergins Trust, Mohawk Oil Co.'s No. 4 Clendennen, Sovereign Oil Co.'s No. 4 San Joaquin, Standard Oil Co.'s No. 1 Abadie and Union Oil Co.'s No. 5 Kernco. The Hancock Oil Co. finished an excellent new well at Mountain View this week when No. 6 Miller was brought in flowing 4,400 bbls. of clean 31.8 gravity oil per day from the Hogan zone. This new well is expected to show a much higher potential as soon as it is given a test by the umpire.

Two new wells were finished in the Edison Field of Kern County this week but neither of them showed substantial production. The Shell Oil Co.'s No. 1 Brown, finished at 2,979 feet after the hole had been plugged back from 3,159 feet, was good for 131 bbls. of 16.1 gravity oil per day on the beam. Shell is expected to complete No. 1 Clare some time within the next week as this well is standing cemented on top of the pay at 2,980 feet. No. 5 Hershey of the A. T. Jergins Syndicate was finished as a pumper doing 160 bbls. of 15.8 gravity oil per day from 1,638 feet. The Honolulu Oil Corp. finished an excellent new well in the Round Mountain Field of Kern County this week when No. 46 in Section 18-28-29 was brought in pumping 710 bbls. of exceptionally clean 15.7 gravity oil per day from 2,250 feet. Honolulu is drilling one other well in this field at present but is grading locations for two more projects which will probably be started within the next 15 days. These shallow wells are easily drilled from spud to completion in less than 30 days. Drilling operations in the Mount Poso Field of Kern County have been increasing during the past several weeks and a check indicates the probable starting of several new wells during the next 15 days. Early this week, the Federal Petroleum Co. abandoned No. 5 Dominion as a duster at 1,502 feet as the Vedder zone topped at 1,486 feet was barren.

### Capitan

The General Petroleum Corp. successfully completed No. 14 Erburu at 2,720 feet and this new well was brought in flowing 110 bbls. of exceptionally clean 43.5 gravity oil per day. Both the General Petroleum and Shell have made plans for additional work in this field. The Elwood Field of Santa Barbara County has taken a new lease on life during the past few weeks with the result that there are seven drilling projects under way at present. One of these, Bankline's No. 8 on tideland permit No. 89, is in the Sespe at 3,571 feet and should be tanking oil shortly if the results of the formation test now being made comes up to expectations. No. 2 Doty of the Barnsdall and Rio Grande is drilling ahead in the Sespe at 6,310 feet, but this well has not yet encountered the pay in this formation. In the Purisima district of Santa Barbara County, the Fairview Oil Co.'s No. 2 Bauterbaugh was given a production test at 3,510 feet, but it was swabbed in flowing hot salt water with only a few small showings of oil. In the Ventura Avenue Field, the Associated Oil Co. successfully completed No. 77 Lloyd, and while this new well failed to show sufficient kick to result in a natural flow it was good for 491 bbls. per day on a compressor from 5,009 feet after the hole had been plugged back from 5,118 feet. The output of this new well is still cutting 46 per cent and may require some remedial work before the well is considered satisfactory.


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